MICROSCAN®

MS-3 Laser Scanner

P/N 83-000000 Rev 4

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Latest Manual Version

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About the MS-3 Laser Scanner

The MS-3 Laser is a ultra-compact scanner that can decode high density symbols from 2 to 10 inches at a 70 degrees scan angle with scan rates of 300 to 1000 decodes per second with a low power draw of 300 mA at 5V. A multi-function **TEST** button, which "out of the box" can do read rate, automatic calibration, and saves, can also be programmed to perform a variety of functions.

Programmable firmware also allows considerable control of multiple features, including 3 programmable relay outputs and new master and trigger inputs.

About This Manual

This manual provides complete information on setting up, installing, and configuring the reader. The chapters are presented in the order in which a reader might be setup and made ready for industrial operation.

Chapter 1, "Quick Start" provides overall step-by-step instructions for getting your reader operational with specific "go to" references to other chapters and appendices.

Host Communications

There are four ways the scanner can be programmed:

1. Microscan's Windows™ based **ESP™** (Easy Setup Program), the preferred method which offers point-and-click ease of use and visual responses to user adjustments. (NOT available at this time.)
2. Serial commands such as **<K100,1>** can be sent from a terminal program.

   Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>** To see all "K" commands, send **<K?>**.
3. Embedded firmware (onboard menus).
4. Bar code symbol configuration.

Highlighting

Serial commands, selections inside instructions, and menu defaults are highlighted in **red bold**.

Cross-references are highlighted in blue. Web links and outside references are highlighted in ***blue bold italics***.

References to menu topics are highlighted in **Bold Initial Caps**. References to topic headings within this manual or other documents are enclosed in quotation marks.

Product Labels

The following labels are located on the top, side, and bottom of the MS-3 Reader:

Top

Side

Bottom

Approvals

This equipment is in compliance or approved by the following organizations:

- CDRH (Center for Devices & Radiological Health)
- UL (Underwriters Laboratories, Inc.)
- cUL (UL mark of Canada)
- TüV (Technischer überwachungs-Verein)
- FCC (Federal Communication Commission)
- CE Compliant
- BSMI (Bureau of Standards, Metrology and Inspection)

Warning and Caution Summary

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For connection to a UL Listed direct plug-in power unit marked Class II and rated at 5VDC at 2 Amps or greater.

European models must use a similarly rated Class I or Class II power supply that is certified to comply with standard for safety EN 60950.

WARNING

Use of controls, adjustments, or performance of procedures other than those specified herein may result in hazardous laser light radiation exposure.

WARNING

There are no user serviceable parts in the scanner. Opening the scanner voids the Microscan Systems warranty and could expose the user to laser diode power of up to 7mW.

WARNING

The laser beam can be harmful to eyesight. Avoid eye contact with the laser beam. Never point the beam at other people, or in a direction where people may be passing.

Chapter

1

Quick Start

Chapter Contents

Step 1 Hardware Required 1-2
Step 2 Connect the System 1-3
Step 3 Initiate Communications 1-4
Step 4 Position Symbol and Scanner 1-5
Step 5 Start Calibration 1-6
Step 6 Test for Read Rate 1-7
Step 7 Save Settings 1-8

This section is designed to get your scanner up and running quickly the user can get a sense of its capabilities and test sample bar code symbols. Detailed setup information for configuring the scanner for your specific application can be obtained in the subsequent chapters.

Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>** To see all “K” commands, send **<K?>**.

Step 1 — Hardware Required

Caution: If using your own power supply, be certain that it is wired correctly and supply voltage is 5VDC. Incorrect wiring or voltage can cause software or equipment failures.

If connecting to a host with an ADP Interface Box, you will need the following:

- (**1**) An MS-3 laser scanner.
- (**2**) An ADP-232 interface box P/N 99-510007-01.
- (**3**) A host computer.
- (**4**) A null modem configuration cable, P/N 61-300026-01, DB-25 plug to DB-9 socket, 6ft.
- (**5**) A power supply P/N 97-100002-01 (120V) or P/N 97-100002-02 (240V).

Optional

- (**6**) An optional object detector (P/N 99-440001-03) can also be connected to the IB-105.

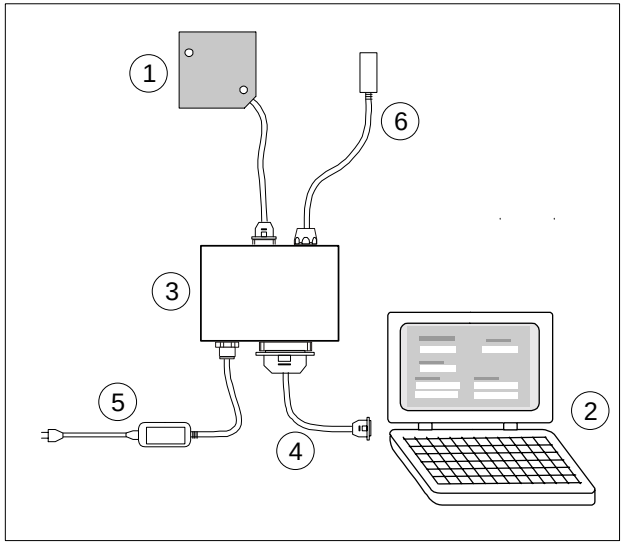


Figure 1-1 Hardware Required

Step 2 — Connect the System

To connect the system, do the following:

1. Connect the scanner (**1**) to the 15-pin connector of the ADP-232 interface box (**2**), using the attached 3-foot cable custom cable.[1]
2. Connect the host computer (**3**) to the ADP's "RS232" 25-pin connector. [2]

   (Refer to "ADP Interface Box" on page A-5 for pin connections.)
3. Connect power supply (**5**) to the ADP's "POWER" connector.
4. Apply power to the system.

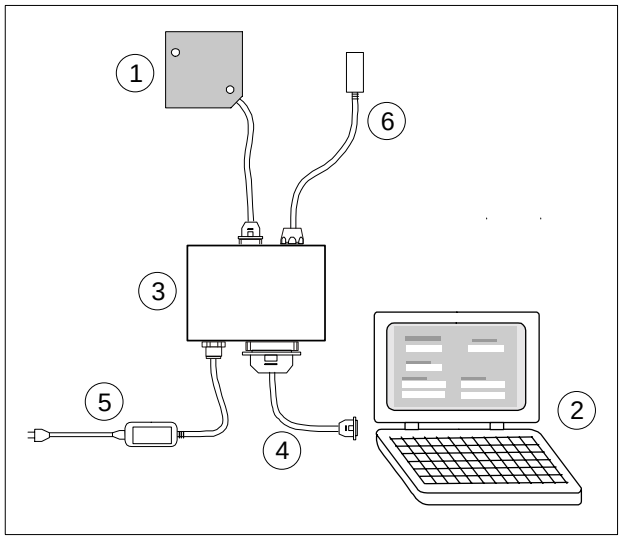


Figure 1-2 Hardware Connections

Caution:

1. Be sure all cables are connected **BEFORE** applying power.
2. Always power down **BEFORE** disconnecting any cables.

1. Since +5 VDC power supply is included in the single cabling assembly, the scanner cable should not exceed 3 feet. RS232 cabling from the 15-pin connector to the host can be up to 47 feet provided it does not include 5 VDC input
2. If using your own null modem RS232 host cable, be certain that the host's TxD connects to the scanner's RxD and the scanner's TxD connects to the host's RxD.

Step 3 — Initiate Communications

From your PC host computer, you can initiate communications with the scanner by:

- Using a terminal communications program such as Hyperterminal™ provided in the Windows™ operating system

In order to communicate with the scanner, you will need to use the following communications settings:

Baud = **9600**

Parity = **Even**

Stop Bits = **One**

Data Bits = **Seven**

Flow Control = **None**

Figure 1-3 Hyperterminal Dialog

Step 4 — Position Symbol and Scanner

Note: If using an I 2/5 symbol, verify that the number of characters in the symbol being scanned matches the symbol length enabled for the I 2/5 symbol type (default is 10 and 6). See "Interleaved 2 of 5" on page 5-13

1. Set up a symbol at the scanning distance you will be using in your application.[1]
2. Avoid bright light or IR light from other sources, including other scanners.
3. Pitch or skew label or scanner slightly to avoid specular reflection, the return of direct, non-diffused light.

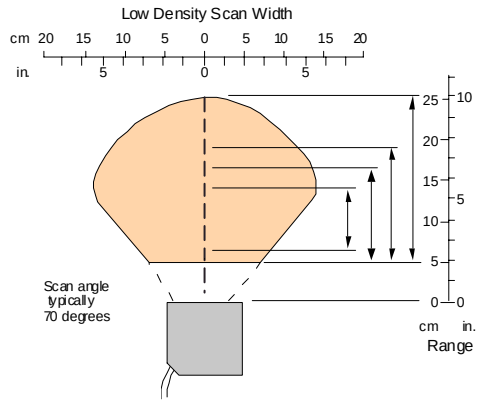


Figure 1-4 Low Density Ranges

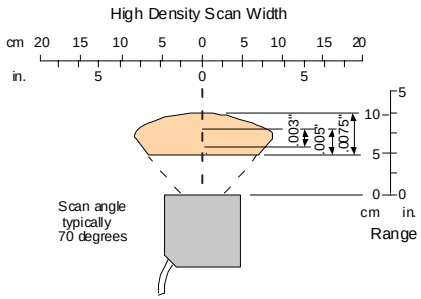


Figure 1-5 High Density Ranges

1–Quick Start

1. Consult Table A-1, "FIS Numbers," on page A-3.

Step 5 — Start Calibration

In the calibration routine, the scanner attempts various settings to determine the optimum decode rate for the given conditions. In this process it might do the following:

- Adjust laser power
- Adjust motor speed
- Adjust AGC gain
- Enable Autodiscrimination (read several symbol types)

1. Start calibration:

   By Serial Command

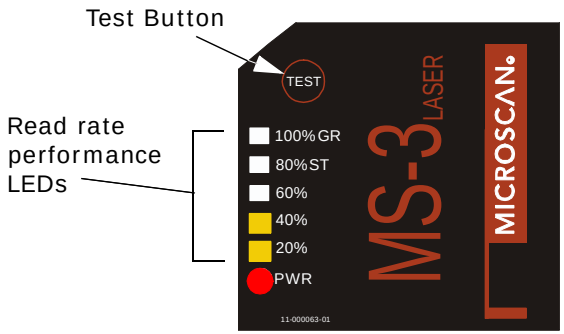
   Send **<@>** from your terminal.

   By the Test button

   Press and hold the **TEST** button until you hear **two** beeps and see **two** amber performance LEDs turn amber to indicate that the calibration is in progress.

2. End calibration:

   The test will end automatically when the optimum combination of settings has been achieved.



Step 6 — Test for Read Rate

By Serial Command

Send **<Cp>** from your terminal.

By Test Button

Press and hold the **TEST** button on the MS-3 until you hear **one** beep and see **one** LED momentarily turn amber. This will signal the beginning of the read rate routine.[1]

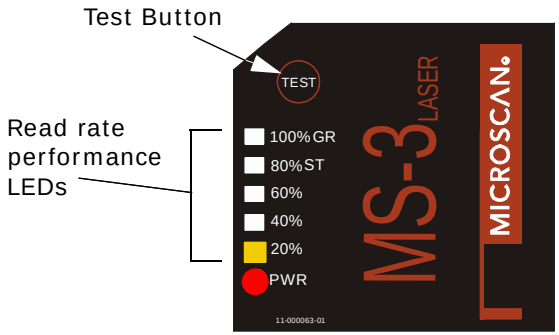
3. Observe read rate performance percentages on the top of the MS-3 LEDs.
4. End the read rate test:

By Serial Command

Send **<J>** from your terminal.

By Test Button

Press the **TEST** button and quickly release.



1. This assumes that the default functions of the test button have not been re-programmed.

Step 7 — Save Settings

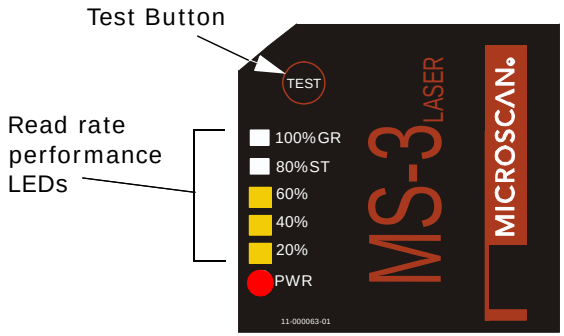
After calibrating the MS-3, you can save your new settings to be available on power-on by:

By Serial Command

Send **<Z>** from your terminal.

By Test Button

Press and hold the **TEST** button until you hear **three** beeps and see **three** performance LEDs momentarily turn amber.[1]



Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>** To see all "K" commands, send **<K?>**.

1. This assumes that the default functions of the test button have not been re-programmed.

Chapter

2

Communications

Chapter Contents

Host Port Parameters 2-4
RS422 Status 2-5
Auxiliary Port 2-6

This section includes connecting parameters and options for communicating by the auxiliary port and various interfaces.

Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Note: Default settings for establishing communications are:

Baud = **9600**
Parity = **Even**
Stop Bits = **One**
Data Bits = **Seven**
Flow Control = **None**

Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>** To see all “K” commands, send **<K?>**.

Communications By Serial Command

Command Title	Format
Host Port Parameters	<**K100,***baud,parity,stop bits,data bits*>
RS422 Status	<**K102,***status*>
Auxiliary Port Parameters	<**K101,***aux port mode,baud,parity,stop bits,data bits,daisy chain status,daisy chain ID*>

Communications by Embedded Menu

Microscan's scanners have embedded menus that can be accessed from the terminal window in ESP or from a separate terminal program. See "Embedded Menus" on page A-22 for instructions on using the embedded menus.

Send a **<D>** command from your terminal to bring up the main menu:

```
                        MICROSCAN SYSTEMS, INC.
                         CONFIGURATION PROGRAM
                              MAIN MENU
                            35-338201-14
------------------------------------------------------------------------------

   TOPICS                       DESCRIPTIONS

1) COMMUNICATIONS               HOST PROTOCOL AND HOST PORT.
2) OPERATIONS                   TRIGGERING, TIMEOUTS, ETC.
3) CODE TYPES 1                 CODE 39, PDF417, I 2 OF 5, UPC, CODE 128.
4) CODE TYPES 2                 CODE 93, CODABAR, ETC.
5) GLOBAL CODE PARAMETERS       MARGINS, SYMB.ID., BACKGROUND, AIAG, ETC.
6) SCANNER OUTPUT               BARCODE,BEEPER,RELAYS,OUTPUT MODES, ETC.
7) SCANNER SETUP                GAIN,SCAN SPEED,TRANSITION COUNT,ETC.
8) DIAGNOSTICS SETUP            WARNING MESSAGES, OPERATION TIME, ETC.


------------------------------------------------------------------------------
            ESC = MAIN MENU OR EXIT    N  = NEXT ITEM
            M   = PREVIOUS MENU        SP = NEXT ITEM
            B   = PREVIOUS ITEM        CR = THIS ITEM
------------------------------------------------------------------------------
MAIN--> COMMUNICATIONS_
```

From the **Main** menu, click **Communications** to select the following screen:

```
                    CURRENT SETTINGS FOR COMMUNICATIONS
------------------------------------------------------------------------------
HOST PROTOCOL                                |PARAMETER| HOST PORT| AUX PORT
-------------------------------------------- |---------|----------|----------
PROTOCOL  = POINT TO POINT                   |BAUD RATE|  9600    |  9600
PREAMBLE  = DISABLED  = <CR><NUL><NUL><NUL>  |PARITY   | EVEN     | EVEN
POSTAMBLE = ENABLED   = <CR><LF><NUL><NUL>   |STOP BITS| ONE      | ONE
ADDRESS   = 1                                |DATA BITS| SEVEN    | SEVEN
RES = <NUL>                                  |PORT MODE| RS232    | N/A
REQ = <NUL>                                  |         |          |
EOT = <NUL>                                  |AUX MODE | N/A      | DISABLED
STX = <NUL>                                  |DAISYCHAIN ID STATUS | DISABLED
ETX = <NUL>                                  |DAISYCHAIN ID DEFINE | 1/
ACK = <NUL>                                  |
NAK = <NUL>                                  |
LRC = DISABLED                               |
INTERCHAR DELAY  =   0  mS                   |
INTERCHAR DELAY  =     0 mS                  |
------------------------------------------------------------------------------
            ESC = MAIN MENU OR EXIT    N  = NEXT ITEM
            M   = PREVIOUS MENU        SP = NEXT ITEM
            B   = PREVIOUS ITEM        CR = THIS ITEM
------------------------------------------------------------------------------
COMMUNICATIONS--> HOST PROTOCOL
```

Host Port Parameters

Baud Rate, Host Port

Definition: The rate at which the scanner and host transfer data back and forth.

Usage: Can be used to transfer data faster or to match host port settings.

Serial Cmd: <**K100,*baud rate***,*parity,stop bits,data bits*>

Default: **9600**

Options:

0 = 600	3 = 4800	6 = 38.4K
1 = 1200	4 = 9600	7 = 57.6K
2 = 2400	5 = 19.2K	8 = 115.2K

Parity, Host Port

Definition: An error detection routine in which one data bit in each character is set to 1 or 0 so that the total number of 1 bits in the data field is even or odd.

Usage: Only changed if necessary to match host setting.

Serial Cmd: <**K100,***baud rate*,***parity***,*stop bits,data bits*>

Default: **Even**

Options: 0 = None 1 = Even 2 = Odd

Stop Bits, Host Port

Definition: One or two bits added to the end of each character to indicate the end of the character.

Usage: Only changed if necessary to match host setting.

Serial Cmd: <**K100,***baud rate*,*parity*,***stop bits***,*data bits*>

Default: **One**

Options: 0 = One 1 = Two

Data Bits, Host Port

Definition: Number of bits in each character.

Usage: Only changed if necessary to match host setting.

Serial Cmd: <**K100,***baud rate*,*parity*,*stop bits*,***data bits***>

Default: **Seven**

Options: 0 = Seven 1 = Eight

RS422 Status

Used only in **Point-to-Point** protocol, and not with RTS/CTS.

Definition: Enables RS422. When RS422 is enabled, RS232 is disabled.

Usage: Only changed if necessary to match host setting.

Serial Cmd: <**K102,***status*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Whenever RS422 is disabled, RS232 is enabled in the background. However, when **Multidrop** is enabled, the functioning protocol is RS485 regardless of the displayed status of RS422. Before enabling RS422, first double-check that **Multidrop** is not enabled.

Auxiliary Port

Note: The aux port cannot be used when the host port is set to RS422 or **Multidrop**.

As with the host port parameters, the auxiliary terminal's settings (baud rate, parity, stop bits, and data bits) must be identical with those of the auxiliary device.

Definition: An auxiliary port connects the scanner to a remote display or to other scanners that can display or transfer data.

Usage: These commands set the communication parameters with the auxiliary port which can be used to configure menus, send data to the host, display data transmissions originating from the host of the scanner, and relay data from other scanners set in tandem (daisy chained). If the scanner's host port needs to be dedicated to the host, but configuration must be done on the fly, the auxiliary port can be set to accept configuration changes by **Command Processing** (page 2-10).

Note: The aux port cannot be used when the host port is set to RS422 or **Multidrop**.

Auxiliary Port Modes

Definition: Determines the flow of data between the auxiliary port device(s), the scanner, and the host.

Serial Cmd: <**K101,*aux port mode***,*baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID*>

Default: **Disabled**

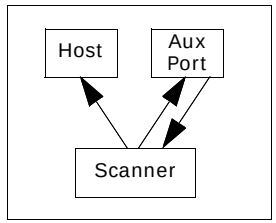
Options:
0 = Disabled
1 = Transparent
2 = Half duplex
3 = Full duplex
4 = Daisy chain
5 = Command Processing

Transparent Mode

Definition: In **Transparent** mode data is passed between the auxiliary port and the host. The scanner buffers data from the auxiliary port and echoes the keyed data on the auxiliary port.

Data initiated from the Auxiliary Port

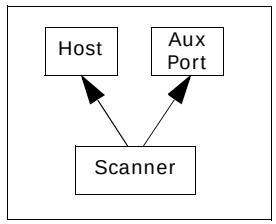
- Auxiliary port data is passed through to the host whenever a return key is pressed at the auxiliary port or bar code data is sent.
- Whenever aux port data is sent with bar code data, the aux port data will appear between the preamble and the bar code data.
- Auxiliary port data to the host is always sent with a preamble and a postamble.
- If the scanner is in a polled mode to the host, auxiliary port data will NOT pass through.



- **<D>** is the only command accepted by the scanner from the auxiliary port. All other commands will pass through to the host.

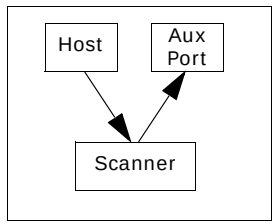
Data initiated from the Scanner

- Transmission to the auxiliary port occurs immediately upon a good read.
- Scan data to the auxiliary port does not include a preamble or a postamble.
- Communications with the auxiliary port is always in Point-to-Point protocol, even if the host is in a polled protocol mode.



Data initiated from the Host

- All host data is echoed to the auxiliary port in unpolled and polled mode.



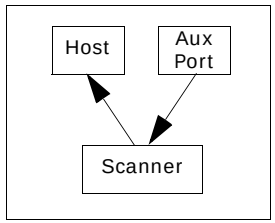
Usage: A common application, in conjunction with handheld scanners, is one that employs an auxiliary readout to detect mis-applied bar code symbols.

Serial Cmd: <**K101,*aux port mode***,*baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID*>
1 = Transparent

Half Duplex Mode

Definition: In **Half Duplex** mode all auxiliary port data and bar code data is sent directly to the host. Bar code data is displayed on the auxiliary port screen at the same time the data is sent to the host.

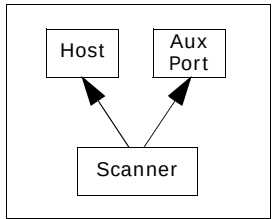
Data initiated from the Auxiliary Port



- Auxiliary port data to the host is ignored if the scanner is in a polled mode.
- Auxiliary port data or scanned data is sent to the host whenever it is received.
- Auxiliary port data is not echoed.
- Auxiliary port data to the host is always sent without a preamble or a postamble.
- **<D>** is the only command that is accepted by the scanner from the auxiliary port. All other commands are passed through to the host.

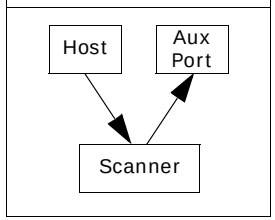
Data initiated from the Scanner

- Scan data is transmitted to the auxiliary port at the same time it is transmitted to the host.
- Data transmission conforms with all parameters specified in the configuration menu (e.g., **Preamble**, **Postamble**, **End of Read Cycle**).



Data is initiated from the Host

- All host data is echoed to the auxiliary port in unpolled mode.



Usage: Useful when the user wants bar code data displayed on an auxiliary screen close to the scanner.

Serial Cmd: <**K101,*aux port mode***,*baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID*>

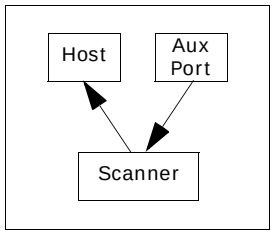
2 = Half Duplex

Full Duplex Mode

Definition: In **Full Duplex** mode all auxiliary port data and bar code data is sent directly to the host. Bar code data is not displayed on the auxiliary port screen.

Data initiated from the Auxiliary Port

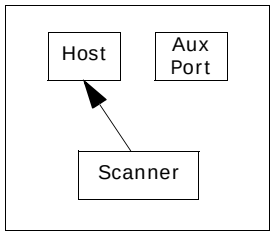
- Auxiliary port data to the host is ignored if the scanner is in a polled mode.
- Auxiliary port data or scanned data is sent to the host whenever it is received.
- Auxiliary port data is not echoed.
- Auxiliary port data to the host is always sent without a preamble or a postamble.



- **<D>** is the only command that is accepted by the scanner from the auxiliary port. All other commands are passed through to the host.

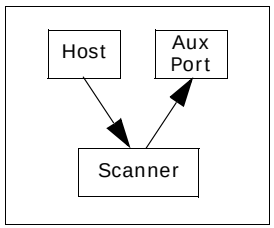
Data initiated from the Scanner

- Scan data is not sent to the auxiliary port.



Data initiated from the Host

- All host data is echoed to the auxiliary port in unpolled mode.



Usage: When communication to and from the auxiliary port is required.

Serial Cmd: *<**K101,aux port mode**,baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID>*

3 = Full duplex

Daisy Chain Mode

Definition: In a daisy chain application, scanners are connected in tandem or "daisy chain" and decoded data is relayed from one scanner to another on up to the host.

A master scanner has its host port linked to the host computer and its auxiliary port linked to the host port of the first "slave" scanner in the chain. Thereafter, each slave's auxiliary port is linked to the host port of the slave that is further from the host in the daisy chain.

Each scanner in the daisy chain can be assigned an ID that accompanies any data that it sends.

Usage: Useful in applications where:

- A bar code symbol might be scanned in both ladder and picket fence directions.
- A bar code symbol may be present on multiple sides of a package.
- Bar code symbols are presented at different depths.

Serial Cmd: <**K101,*aux port mode***,*baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID*>

Options: **4 = Daisy chain**

Function: Before the master scanner times out, it checks its auxiliary port for data. It should be set to wait at least **20** mS for each slave in the daisy chain. (See "Timeout Duration" on page 4-17.) If no data is received within the read cycle timeout, the master sends a noread message to the host. Otherwise the complete data is sent.

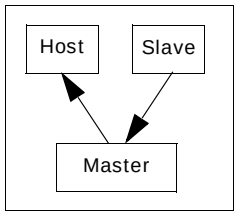
If for example a master scanner is set to timeout in 120 mS, the first slave scanner might be set to 100 mS, the next to 80 mS, and so forth, thus assuring that at least 20 mS elapses between transmissions.[a]

Daisy-chained scanners can send a series of symbols by enabling **Multisymbol** and a common multisymbol separator. If the master scanner does not receive the expected number of symbols, noread messages are appended to the data string to make up the difference between the number of symbols enabled in **Multisymbol** and the number of symbols read.

For example, a master and two slaves have **Number of Symbols** set to 3 and **Multisymbol Separator** defined as %. If the master and the first slave do not find symbols, but the next slave scanner registers a good read, the transmitted results will be: symbol data % noread % noread.

a. The above example is based on the best case. Other factors such as baud rate, dynamic focus timing, number of characters in a given symbol, and the number of slaves in the daisy chain can affect timing and may need to be included in your calculations for complete accuracy.

Conditions: The conditions for a daisy chain application are as follows:



1. The master scanner's trigger must be **Serial** or **External**; the slave scanners' triggers are configured for **Serial**.
2. All scanners are enabled to **Daisy Chain** mode.
3. Each scanner's auxiliary port must be connected to the Host port of its slave scanner.
4. Each slave scanner in the daisy chain must be set to send its data no less than **20** mS before its preceding scanner.
5. All but the master scanner must have **Postamble** enabled and set to **CR** (^M) only.
6. All but the master scanner must have their noread messages disabled.
7. If **Multisymbol** is enabled, **Multisymbol Separator** characters must match in all scanners and **Number of Symbols** must be set to number large enough to include all the symbols it may itself read plus the number of symbols that it will be expected to relay to the host or the next scanner up the line.
8. **Symbology ID** enable/disable must be the same in all scanners.
9. All but the master scanner must have their diagnostic warning messages disabled.
10. **Daisy Chain ID Status** enable/disable and the number of characters in **Daisy Chain ID** must be the same in all scanners.

Command Processing Mode

Definition: When enabled, **Command Processing** allows commands to be entered via the aux port and direct externally triggered read cycle data in one of two ways:

1. If the last command came from the aux port, then externally triggered read cycle data will be output to both the host and the aux ports.
2. If the last command came from the host port, then externally triggered read cycle data will only be output to the host port.

Usage: Allows user to direct externally triggered read cycle data to the host or both the host and aux ports.

Serial Cmd: <**K101,*aux port mode***,*baud rate,parity,stop bits,data bits,daisy chain ID status,daisy chain ID*>

Options: **5 = Command Processing**

Aux Port Communications Parameters

As with the host port parameters, the auxiliary terminal's settings (baud rate, parity, stop bits, and data bits) must be identical with those of the auxiliary device.

Baud Rate, Aux Port

Definition: The rate at which the scanner and host transfer data back and forth.

Usage: Can be used to transfer data faster or match an auxiliary device.

Serial Cmd: <**K101,***aux port mode*,***baud rate***,*parity,stop bits,data bits,daisy chain ID status,daisy chain ID*>

Default: **9600**

Options:

0 = 600	3 = 4800	6 = 38.4K
1 = 1200	4 = 9600	7 = 57.6K
2 = 2400	5 = 19.2K	8 = 115.2K

Parity, Aux Port

Definition: An error detection routine in which one data bit in each character is set to 1 or 0 so that the total number of 1 bits in the data field is even or odd.

Usage: Only changed if necessary to match host setting.

Default: **Even**

Options: <**K101,***aux port mode,baud rate,****parity****,stop bits,data bits,daisy chain ID status,daisy chain ID*>

Serial Cmd:
0 = None
1 = Even
2 = Odd

Stop Bits, Aux Port

Definition: Allows the user to select the last one or two bits in each character to indicate the end of the character.

Usage: Only changed if necessary to match host setting.

Serial Cmd: <**K101,***aux port mode,baud rate,parity,****stop bits****,data bits,daisy chain ID status,daisy chain ID*>

Default: **One**

Options: 0 = One 1 = Two

Data Bits, Aux Port

Definition: Number of bits in each character.

Usage: Only changed if necessary to match host setting.

Serial Cmd: <**K101,***aux port mode,baud rate,parity,stop bits,****data bits****,daisy chain ID status,daisy chain ID*>

Default: **Seven**

Options: 0 = Seven 1 = Eight

Daisy Chain ID Status

Definition: Each scanner in a daisy chain can be assigned a one or two character ID that will appear in front of decoded data and identify its source.

Usage: Used in a daisy chain setup in cases where the host needs to know which scanner in a daisy chain setup sent the data.

Serial Cmd: <**K101,***aux port mode,baud rate,parity,stop bits,data bits,**daisy chain ID status**,daisy chain ID*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Note: Enable/disable and length must be the same in all scanners.

Daisy Chain ID

Definition: A one or two character prefix which identifies the particular daisy chain scanner from which the data is being sent.

Usage: Used in a daisy chain setup in cases where the host needs to know which scanner sent the data.

Serial Cmd: <**K101,***aux port mode,baud rate,parity,stop bits,data bits,daisy chain ID status,**daisy chain ID***>

Default: **1***/*

Options: Any one or two ASCII characters.

Chapter

3

Protocol

Chapter Contents

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Protocols are the rules by which devices pass data back and forth. This section includes the basic options available for data communication, including multidrop and user-defined options and output data formats.

Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>** To see all “K” commands, send **<K?>**.

Protocol By Serial Command

Command Title	Format
Host Protocol	<**K140,***protocol*>
LRC	<**K145,***status*>
Response Timeout	<**K143,***response timeout*>
Intercharacter Delay	<**K144,***intercharacter delay*>
Preamble	<**K141,***preambole status,preamble*>
Postamble	<**K142,***postamble status,postamble*>

Protocol by Embedded Menu

For information on accessing the embedded menus, see “Embedded Menus” on page A-22.

From the **Main** menu, scroll down through the options and select the following screen:

```
                    CURRENT SETTINGS FOR COMMUNICATIONS
-------------------------------------------------------------------------------
HOST PROTOCOL                                    |PARAMETER| HOST PORT| AUX PORT
-------------------------------------------------|---------|----------|----------
PROTOCOL  = POINT TO POINT                       |BAUD RATE|  9600    |  9600
PREAMBLE  = DISABLED = <CR><LF><NUL><NUL>        |PARITY   | EVEN     | EVEN
POSTAMBLE = ENABLED  = <CR><LF><RS><SPC>         |STOP BITS| ONE      | ONE
ADDRESS   =                                      |DATA BITS| SEVEN    | SEVEN
RES = <NUL>                                      |PORT MODE| RS232    | N/A
REQ = <NUL>                                      |         |          |
EOT = <NUL>                                      |AUX MODE | N/A      | DISABLED
STX = <NUL>                                      |DAISYCHAIN ID STATUS| DISABLED
ETX = <NUL>                                      |DAISYCHAIN ID DEFINE| 1/
ACK = <NUL>                                      |
NAK = <NUL>                                      |
LRC = DISABLED                                   |
RESPONSE TIMEOUT =    12 ms                      |
INTERCHAR DELAY  =     0 ms                      |
-------------------------------------------------------------------------------
            ESC = MAIN MENU OR EXIT    N  = NEXT ITEM
            M   = PREVIOUS MENU        SP = NEXT ITEM
            B   = PREVIOUS ITEM        CR = THIS ITEM
-------------------------------------------------------------------------------
COMMUNICATIONS--> HOST PROTOCOL
```

Protocol

Definition: Protocols define the sequence and format in which information is transferred between the scanner and the host, or in the case of **Multidrop**, between scanners and a concentrator.

Usage: In general, the point-to-point protocols will work well in most applications. They require no address and must use RS232 or RS422 communications standards.

Default: **Point-to-Point**

Options:
0 = Point-to-Point
1 = Point-to-Point with RTS/CTS
2 = Point-to-Point with XON/XOFF
3 = Point-to-Point with RTS/CTS & XON/XOFF
4 = Polling Mode D
5 = Multidrop
6 = User Defined
7 = User Defined Multidrop

If selecting one of the options from 0 to 4 (**Point-to-Point**, **Point-to-Point with RTS/CTS**, **Point-to-Point with XON/XOFF**, **Point-to-Point with RTS/CTS and XON/XOFF**, or **Polling Mode D**), use the <**K1140,***protocol*> format.

Option 5 through 7 are special cases and discussed later in this section.

Point-to-Point (standard)

Definition: Standard **Point-to-Point** requires no address and sends data to the host whenever it is available, without any request or handshake from the host.

Usage: Used only with RS232 or RS422.

Serial Cmd: <**K140,*0***>

Point-to-Point with RTS/CTS

Definition: **Point-to-Point with RTS/CTS** (request-to-send/clear-to-send) is a simple hardware handshaking protocol that allows a scanner to initiate data transfers to the host.

Usage: A scanner initiates a data transfer with an RTS (request-to-send) transmission. The host, when ready, responds with a CTS (clear-to-send) and the data is transmitted. CTS and RTS signals are transmitted over two dedicated wires as defined in the RS-232 standard.

Used only with RS232.

Serial Cmd: <**K140,,*1***>

Point-to-Point with XON/XOFF (Transmitter On/Off)

Definition: This option enables the host to send the XON and XOFF command as a single byte transmission command of start (^Q) or stop (^S).

Usage: If an XOFF has been received from the host, data will not be sent to the host until the host sends an XON. During the XOFF phase, the host is free to carry on other chores and accept data from other devices.

Used only with RS232.

Serial Cmd: <**K140,*2***>

Point-to-Point with RTS/CTS & XON/XOFF

Definition: This option is a combination of **Point-to-Point with RTS/CTS** and **Point-to-Point with XON/XOFF.**

Usage: Used only with RS232.

Serial Cmd: <**K140,*3***>

Polling Mode D

Definition: Like **Point-to-Point**, **Polling Mode D** requires a dedicated connection to the host; but unlike **Point-to-Point**, it requires an address and must wait for a poll from the host before sending data.

Usage: When in **Polling Mode D,** an address of 1 is automatically displayed on the configuration screen. However, during transmission, a 1C hex poll address (FS) and a 1D hex select address (GS) are substituted for the 1.

Serial Cmd: <**K140,*4***>

Multidrop

Definition: **Multidrop** allows up to 50 devices to be connected to a single RS485 host, with the scanner assigned an unique address (from 01 to 50).

Usage: The MS-5000 can be used as a concentrator to a single host port connection.

When **Multidrop** is selected, the protocol characters for RES, REQ, etc. are assigned automatically.

Multidrop Addresses: Each address has its own separate poll and select address (from 1C to 7F hex).

Options: 01 through 50

Serial Cmd: If selecting **Multidrop** fan address must be defined and appended to the command string.

Format: <**K100,*5***,*address[01 to 50]*>

Note: Scanners linking up to a Microscan MS-5000 multidrop concentrator must be configured in standard multidrop protocol.

User Defined Point-to-Point

Definition: **User Defined Point-to-Point** allows the user to customize the point-to-point protocol.

Usage: Useful for developing custom protocols in polled or unpolled mode.

Serial Cmd: <**K140,*6***,*RES,address,REQ,EOT,STX,ETX,ACK,NAK,from host*>

User Defined Address

Definition: **User Defined** is considered to be in a polled mode only if an address has been assigned.

Serial Cmd: <**K140,*6***,*RES,****address***,*REQ,EOT,STX,ETX,ACK,NAK,from host*>

Default: No address

Options: *Any ASCII character except a null.*

User Defined Example

Definition: Example: ACK/NAK protocol can be configured using **User Defined**. The scanner will transmit data to the host when an **ACK** is received. If a **NAK** or response timeout occurs, the scanner will re-send the data to the host up to 3 more times before aborting.

Tip: To use **User Defined Point-to-Point**, first select **Point-to-Point <K100,*0*>** and then **User Defined <K100,*6*>**.

Example: To select an unpolled ACK/NAK **User Defined** protocol with LRC disabled, send **<K100,*0*><K100,*6*,,,,,,^F,^U><Kc*0*>**. ACK and NAK will be displayed in the menu.

Serial Cmd: <**K140,*6***,*RES,address,****REQ,EOT,STX,ETX,ACK,NAK***,*from host*>

Default: **No assignment**

Options: Any ASCII character except a null. Control characters can be used to define RES through NAK in serial commands.

From Host

Definition: This option allows the handshaking protocol to be initiated from the host, if not configured in an unpolled mode. Messages sent to the host will include the scanner's defined protocol. The status of **From Host** determines if messages sent from the host to the scanner must include the defined protocol. If **From Host** is disabled, the defined protocol is not included. If **From Host** is enabled, the defined protocol must be included.

Serial Cmd: <**K140,*6***,*RES,address,REQ,EOT,STX,ETX,ACK,NAK,****from host***>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

User Defined Multidrop

Note: Any ASCII character except a null (00) and a ^A (01) can be assigned as an address. Control characters can be used to define RES through NAK in serial commands. "Communication Protocol Commands" on page A-11

Definition: **User Defined Multidrop** allows the user to customize the polling protocol.

Usage: This option is used when connecting to a concentrator or other device that does not match standard multidrop protocol.

If selecting **User Defined Multidrop** (7), complete the format by either choosing new parameters or place commas where unchanged data fields occur.

Serial Cmd: <**K140,7**,*RES,address,REQ,EOT,STX,ETX,ACK,NAK*>

For **User Defined Multidrop**, first select **Multidrop** **<K140,5>**, then **User Defined Multidrop** **<K140,7...>**.

Address: Any single character (02 hex to 7E hex) in the ASCII table can be assigned as the address character. The character chosen is used as the poll character and the subsequent ASCII character becomes the select character. For example, if a **^B** (02 hex) is selected as the address, **^C** (03 hex) becomes the select address that the host will use in sending host select commands.

Note: Definitions of commands in **User Defined** and **User Defined Multidrop** must be duplicated in host applications to enable poll and select sequences to execute correctly during transmission.

Note: Typically, parameters in **User Defined Multidrop** are defined by first enabling **Multidrop**, then enabling **User Defined Multidrop**. This pre-loads multidrop characters into the parameters. Then changes are made to individual characters to match the host or other requirements.

LRC

(Longitudinal Redundancy Check)

Definition: An error-checking routine that verifies the accuracy of transmissions. It is the exclusive OR of all characters following the **STX** (start of text) up to and including the **ETX** (end of text). What this means is that the binary representation of all the characters in a transmissions are cumulatively added in a column and each resulting odd integer is assigned a 1 and each even integer a 0 (two 1s = 0, two 0s = 0, a 1 and a 0 = 1). The extra **LRC** character is then appended to the transmission and the receiver (usually the host) performs the same addition and compares the results.

Usage: Used when extra data integrity is required.

Serial Cmd: <**K145,***status*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Response Timeout

Definition:	Time the scanner will wait before timing out if **ACK**, **NAK**, and **ETX** are enabled, and a host response is expected.
Usage:	Only used when a response is required from the host. While in **Multi-drop**, if the scanner does not receive an **ACK** or **NAK** from the host after sending polled data, it will act on a fault. The scanner can be set to wait indefinitely by setting **Response Timeout** to zero.
Serial Cmd:	<**K143,***response timeout*>
Default:	**0** (causes an indefinite wait.)
Options:	0 to 65000 (0 to 65 seconds)

Intercharacter Delay

Definition: The time interval in milliseconds between individual characters transmitted from the scanner to the host.

Usage: **Intercharacter Delay** is only used where a host cannot receive data quickly enough and there is enough time between symbols to allow data to be completely transferred. It is rarely used since any setting other than zero will slow down communications. For example, a 200 setting will result in a 1/5 second delay between each character that is transmitted.

Serial Cmd: <**K144,***intercharacter delay*>

Default: **0**

Options: 0 to 255 (in milliseconds). Zero (0) causes no delay between characters.

Preamble Characters

Definition: Defines a one to four character data string that can be added to the front of the decoded data.

Usage: Useful for identifying and controlling incoming data. For example, defining the **preamble** as a carriage return and a line feed causes each decoded message to be displayed of on its own line.

Preamble Status

Serial Cmd: <**K141,*preamble status***,*preamble character(s)*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled (within any protocol)

Preamble Character(s)

Serial Cmd: <**K141,***preamble status*,***preamble character(s)***>

Default: **^M** corresponds to: **carriage return/null/null/null**.

Options: Up to four user-defined ASCII characters, including control characters.

Within a Serial Command

To enter control characters within a serial command, hold down the control key while typing the desired character.

Example: **<K141,1,CNTL-m>** to enter **^M**

Within an Embedded Menu

Control characters entered on the command line are displayed in the menu as mnemonic characters, such as: <CR><NUL><NUL><NUL>.

To enter a control character from within an embedded menu, first type in a space (with the space key). This has the effect of allowing the control key to be recognized as a part of the control character. Next hold down the control key while typing the desired character.

Example: **Space CNTL-m** to enter **^M.**

Postamble Characters

Definition: Defines a one to four character data string that can be added to the end of the decoded data.

Usage: Useful for identifying and controlling incoming data. For example, defining the postamble as a carriage return and a line feed causes each decoded message to be displayed of on its own line.

Postamble Status

Serial Cmd: <**K142,*postamble status***,*postamble character(s)*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled (within any protocol)

Postamble Character(s)

Serial Cmd: <**K142,***postamble status*,***postamble character(s)***>

Default: **^M^J**. Corresponds to carriage return/line feed/null/null, as displayed in the menu.

Options: Up to four user-defined ASCII characters, including control characters.

Within a Serial Command

To enter control characters within a serial command, hold down the control key while typing the desired character.

Example: **<Ke1,CNTL-m CNTL-j>** to enter ^M^J.

Within an Embedded Menu

Control characters entered on the command line are displayed in the menu as mnemonic characters, such as: <CR><LF><NUL><NUL>

To enter a control character from within an embedded menu, first type in a space (with the space key). This has the effect of allowing the control key to be recognized as a part of the control character. Next hold down the control key while typing the desired character.

Example: **Space CNTL-m Space CNTL-j** to enter ^M^J.

Chapter

4

Read Cycle/Trigger

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Read cycles and triggering modes are at the heart of bar code scanning. After you've established communications and completed basic read rate testing, you will need to address the spatial and timing parameters associated with your application. In a typical operation a bar coded item moves along a line past a scanner. A trigger or timer activates a read cycle during which the scanner actively searches for symbols. You will need to decide how to initiate the read cycle and how and when to end it. This section addresses these issues.

Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>** To see all "K" commands, send **<K?>**.

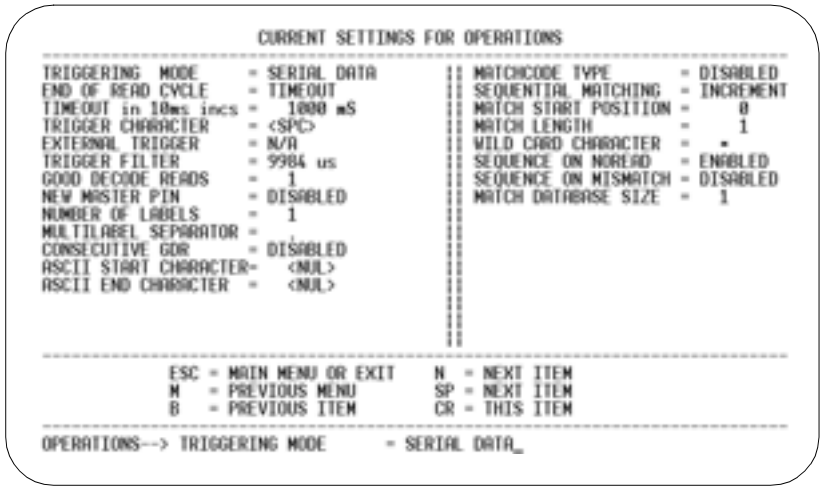
Read Cycle by Serial Command

Command Title	Format
Trigger Mode	<**K200,***trigger mode,trigger filter duration*>
External Trigger State	<**K202,***external trigger state*>
Serial Trigger Character	<**K201,***serial trigger character*>
Start Serial Trigger Character	<**K229,***start trigger character*>
End Serial Trigger Character	<**K230,***end trigger character*>
Good Decode Reads	<**K221,***decodes before output,consecutive status*>
End of Read Cycle	<**K220,***end of read cycle,timeout duration*>
Multisymbol	<**K222,***number of symbols,multisymbol separator*>

Read Cycle by Embedded Menu

For information on accessing the embedded menus, see “Embedded Menus” on page A-22.

From the **Main** menu, scroll down through the options and select the following screen:


CURRENT SETTINGS FOR OPERATIONS
TRIGGERING MODE = SERIAL DATA
END OF READ CYCLE = TIMEOUT
TIMEOUT in 10ms incs = 1000 mS
TRIGGER CHARACTER = <SPC>
EXTERNAL TRIGGER = N/A
TRIGGER FILTER = 9984 us
GOOD DECODE READS = 1
NEW MASTER PIN = DISABLED
NUMBER OF LABELS = 1
MULTILABEL SEPARATOR = ,
CONSECUTIVE GDR = DISABLED
ASCII START CHARACTER = <NUL>
ASCII END CHARACTER = <NUL>
MATCHCODE TYPE = DISABLED
SEQUENTIAL MATCHING = INCREMENT
MATCH START POSITION = 0
MATCH LENGTH = 1
WILD CARD CHARACTER = *
SEQUENCE ON NOREAD = ENABLED
SEQUENCE ON MISMATCH = DISABLED
MATCH DATABASE SIZE = 1
ESC = MAIN MENU OR EXIT
M = PREVIOUS MENU
B = PREVIOUS ITEM
N = NEXT ITEM
SP = NEXT ITEM
CR = THIS ITEM
OPERATIONS--> TRIGGERING MODE = SERIAL DATA_

Trigger Mode

Definition: The type of trigger event that will initiate the read cycle.

Serial Cmd: <**K200,*trigger mode*,***trigger filter duration***>*

Default: **Continuous Read**

Options:
0 = Continuous Read
1 = Continuous Read 1 Output
2 = External Level
3 = External Edge
4 = Serial Data
5 = Serial Data & External Edge

Continuous Read

Definition: In **Continuous Read**, trigger input options are disabled, the scanner is always in the read cycle, and it will attempt to decode and transmit every scan crossing a symbol.

When To Output and **Noread** options have no affect on **Continuous Read**.

Usage: **Continuous Read** is useful in testing symbol readability or scanner functions. It is not recommended for normal operations.

Serial Cmd: <**K200,*0***>

Continuous Read 1 Output

Definition: In **Continuous Read 1 Output** the scanner self-triggers whenever it decodes a new symbol or a timeout occurs.

If **End Of Read Cycle** is set to **Timeout** and the symbol doesn't change, the scanner will repeat the output at the end of each timeout period. For example, if **Timeout** is set to one second, the scanner sends the symbol data immediately and repeats the output at intervals of one second for as long as the symbol continues to be scanned.

If **End Of Read Cycle** is set to **New Trigger**, the scanner will send the current symbol data immediately, but send it only once. A new symbol appearing in the scanner's range will be read and sent immediately provided it is not identical to the previous symbol read.

Usage: **Continuous Read 1 Output** can be useful in applications where it is not feasible to use a trigger and all succeeding symbols contain different information. It is also effective in applications where the objects are hand-presented.

Serial Cmd: <**K200,*1***>

Caution: In automated environments, **Continuous Read 1 Output** is not recommended because there is no one to verify that a symbol was missed.

Note: If **Trigger** is set to **Continuous Read 1 Output**, **Number of Symbols** will default back to **1** (if set to any number greater than 1).

External Trigger Level

Definition: **External Trigger Level** allows the read cycle to begin when a trigger (change of state) from an external sensing device is received. The read cycle endures until the object moves out of the sensor range and the active trigger state changes again.

Usage: This mode is effective in an application where the speeds of the conveying apparatus are variable and the time the scanner spends scanning each object is not predictable. It also allows the user to determine if a noread has occurred.

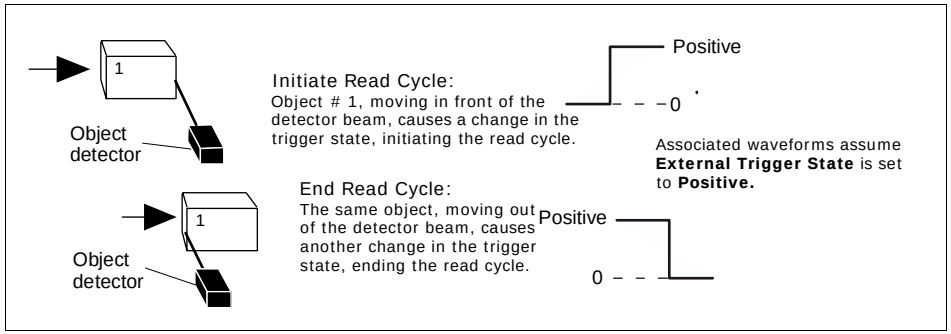

1
Object detector
Initiate Read Cycle:
Object # 1, moving in front of the detector beam, causes a change in the trigger state, initiating the read cycle.
Positive
0
Associated waveforms assume **External Trigger State** is set to **Positive.**
1
Object detector
End Read Cycle:
The same object, moving out of the detector beam, causes another change in the trigger state, ending the read cycle.
Positive
0

Figure 4-1 Trigger Level

Serial Cmd: <**K200,2**>

Important: Level and **Edge** apply to the active logic state (**Positive** or **Negative**) that exists while the object is in a read cycle, between the rising edge and falling edge. *Rising edge* is the trigger signal associated with the appearance of an object. *Falling edge* is the trigger signal associated with the subsequent disappearance of the object

External Trigger Edge

Definition: **External Trigger Edge**, as with Level, allows the read cycle to begin when a trigger (change of state) from an external sensing device is received. However, the passing of an object out of sensor range does not end the read cycle. The read cycle ends with a good read output or, depending on **End of Read Cycle** setting, a timeout or new trigger occurs.

Usage: This mode is highly recommended in any application where conveying speed is constant or if spacing, object size, or timeouts are consistent.

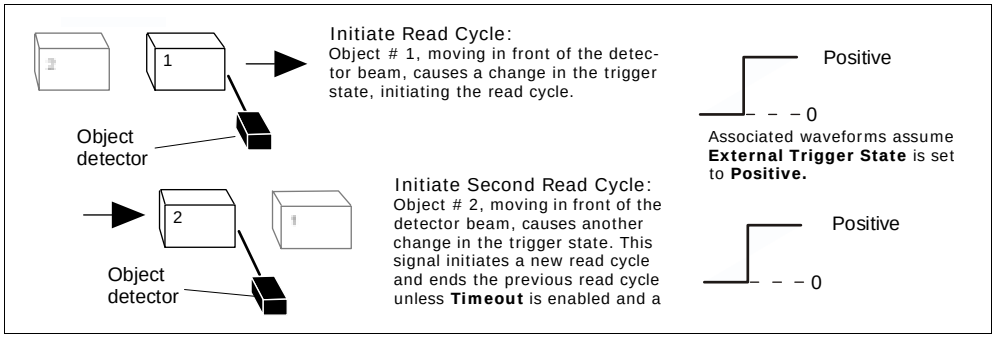

1
Object detector
Initiate Read Cycle:
Object # 1, moving in front of the detector beam, causes a change in the trigger state, initiating the read cycle.
Positive
0
Associated waveforms assume **External Trigger State** is set to **Positive.**
2
Object detector
Initiate Second Read Cycle:
Object # 2, moving in front of the detector beam, causes another change in the trigger state. This signal initiates a new read cycle and ends the previous read cycle unless **Timeout** is enabled and a
Positive
0

Figure 4-2 Trigger Edge

Serial Cmd: <**K200,3**>

Important: Level and **Edge** apply to the active logic state (**Positive** or **Negative**) that exists while the object is in a read cycle, between the rising edge and falling edge. *Rising edge* is the trigger signal associated with the appearance of an object. *Falling edge* is the trigger signal associated with the subsequent disappearance of the object.

Serial Data

Definition: In **Serial Data**, the scanner accepts an ASCII character from the host or controlling device as a trigger to start a read cycle. A **Serial Data** trigger behaves the same as an **External Edge** trigger.

Serial commands are entered inside corner brackets, such as **<t>**.

Usage: **Serial Data** is effective in a highly controlled environment where the host knows precisely when the object is in the scan zone. It is also useful in determining if a noread has occurred.

Serial Cmd: <**K200,*4***>

Serial Data or External Edge

Definition: In this mode the scanner accepts either a serial ASCII character or an external trigger pulse to start the read cycle.

Usage: **Serial Data or External Edge** is seldom used but can be useful in an application that primarily uses an external sensing device but occasionally needs to be manually triggered.

An auxiliary terminal can be connected to the aux port so the user can send the serial trigger character through the scanner to the host.

Serial Cmd: <**K200,*5***>

Trigger Filter Duration

Definition:	**Trigger Filter Duration** can prevent trigger bounce from falsely triggering the scanner by limiting the time in which trigger pulses can be received.
Usage:	**Trigger Filter Duration** is useful where trigger bounce could cause false triggers.
Serial Cmd:	<**K200,***trigger mode*,***trigger filter duration***>
Default:	**244**(10 mS)
Options:	2 to 65535 (corresponding to 82 µS to 2.68S in 40.9 µS steps)

External Trigger State

Note: External Level, **External Edge**, or **Serial Data or Edge** trigger mode must be enabled for **External Trigger** to take effect.

Definition: Determines whether a positive or negative transition will initiate the read cycle.

Usage: Users can select the trigger polarity that will operate with their systems. (If using the Microscan object detector, use **Positive**.)

Serial Cmd: <**K202,*external trigger state***>

Default: **Positive**

Options: 0 = Negative 1 = Positive

Serial Trigger Character

Definition: A single ASCII host serial trigger character that initiates the read cycle.

Serial Trigger Character is considered an on-line host command and requires the same command format as all host commands: that is, to be entered within angle brackets delimiters **< >**.

Usage: Allows the user to define the trigger character that initiates the read cycle.

Serial Trigger Character (delimited)

Definition: A delimited trigger character is one that either starts or ends the read cycle and is enclosed by delimiters such as < >.

Usage: Allows the user to define the trigger character that initiates the read cycle.

Serial Cmd: <**K201,*serial trigger character***>

Default: **^]** (corresponds to <GS> displayed in the embedded menu)

Options: Any single ASCII character, including control characters, except NUL (00H), an existing host command character, or an on-line protocol character. Control characters entered on the command line are displayed in the menu as mnemonic characters.

Note: **Serial Data** or **Serial Data or Edge** triggering mode must be enabled for **Serial Trigger Character** to take effect.

Start and End Trigger Characters (non-delimited)

Definition: A non-delimited trigger character is one that either starts or ends the read cycle and is NOT enclosed by delimiters such as < >.

Both **Start** and **End** non-delimited characters can be defined and will function according to the trigger event, as follows:

When defining **Start** and **End** trigger characters, the following rules apply:

- In **External Edge** the scanner looks only for the **Start Trigger Character** and ignores any **End Trigger Character** that may be defined.
- In **External Level**, the **Start Trigger Character** begins the read cycle and **End Trigger Character** ends it. Note that even after a label has been decoded and the label data transmitted, the scanner remains in **External Level** trigger read cycle until a **Stop** character is received.
- In **Serial Data & Edge** trigger mode, command, either a **Start Trigger Character** or a hardware trigger can start an **Edge** trigger read cycle.

Usage: It is useful in applications where different characters are required to start and end a read cycle.

Note: **Start** and **End** serial trigger characters can be sent through host ports or aux ports, but not the IrDA port.

Start Serial Trigger Character (non-delimited)

Definition: A single ASCII host serial trigger character that starts the read cycle and is not enclosed by delimiters such as < and >.

Serial Cmd: <**K229,*start trigger character***>

Default: **Null** (disabled)

Options: Two hex digits representing an ASCII character except <, >, XON and XOFF.

Note: **Serial Data** or **Serial Data or Edge** triggering mode must be enabled for **Serial Trigger Character** to take effect.

End Serial Trigger Character (non-delimited)

Definition: A single ASCII host serial trigger character that ends the read cycle and is not enclosed by delimiters such as < and >.

Usage: It is useful in applications where different characters are required to start and end a read cycle.

Serial Cmd: <**K230,*end trigger character***>

Default: **Null** (disabled)

Options: Two hex digits representing an ASCII character except <, >, XON and XOFF.

Note: **Serial Data** or **Serial Data or Edge** triggering mode must be enabled for **Serial Trigger Character** to take effect.

Good Decode Reads

Note: When setting up, determine if the scanner's scan rate is capable of scanning your longest symbol the required number of times.

Decodes Before Output

Definition: The number of decodes (from 1 to 31) required per symbol before a symbol's decoded data is sent. It requires the scanner to successfully decode a symbol a designated number of times before it is sent. If it doesn't achieve the number of good reads during the read cycle, then a noread will be sent.

Note: Higher settings will decrease throughput speed.

Usage: This is a very useful feature to increase reliability of reads for symbologies that do not have internal error checking such as Pharmacode.

Serial Cmd: <**K221, *decodes before output***,*consecutive status*>

Default: **1**

Options: 1 to 255

Consecutive Status

Definition: When consecutive is enabled, the number set in **Decodes Before Output** must be achieved consecutively before decoded data is sent.

When the default non-consecutive is set, whenever a cumulative number of decodes is achieved, decoded data is sent. For example, if non-consecutive is enabled and **Decodes Before Output** is set to 10, then data will be sent when the total number of decodes reaches 10 regardless of the number of bad reads between decodes.

Usage: Useful when the highest level of reliability is required.

Serial Cmd: <**K221,***decodes before output*,***consecutive status***>

Default: **Non-consecutive**

Options: 0 = Non-consecutive

1 = Consecutive

Read Cycle

Note: **When to Output** must be set to **End of Read Cycle** before this command can be active.

Definition: The read cycle is the time during which the scanner will attempt to read and decode a symbol. At the end of a read cycle the scanner stops reading symbols and sends the symbol data or noread message to the host.

End of Read Cycle Mode

Definition: A read cycle can be terminated by a new trigger, a timeout, or a combination of both.

Serial Cmd: <**K220,*end of read cycle***,*timeout duration*>

Default: **Timeout**

Options: 0 = Timeout

1 = New Trigger

2 = Timeout & New Trigger

Note: When operating in **Continuous Read** or **Continuous Read 1 Output**, the scanner is always in the read cycle.

Timeout

Definition: **Timeout** ends the read cycle when the time set in **Timeout** elapses or "times out."

If in **Continuous Read 1 Output**, a timeout initiates a new read cycle and allows the same symbol to be read again.

With either **External Edge**, **Serial Data**, or **Serial Data & Edge** enabled, a timeout ends the read cycle and symbol data or a noread message is sent to the host.

With **External Level** enabled, the read cycle does not end until the falling edge trigger or a timeout occurs. The next read cycle does not begin until the next rising edge trigger.

Usage: Typically used with **Serial** or **Edge** and **Continuous One**.

It is effective in highly controlled applications when the maximum length of time between objects can be predicted. It assures that a read cycle ends before the next bar coded object appears, giving the system extra time to decode and transmit the data to the host.

New Trigger

Definition: **New Trigger** ends the current read cycle and initiates a new one when a new trigger occurs. **New Trigger** refers only to a "rising edge" trigger.

With either **External Edge**, **Serial**, or **Serial or Edge** enabled, an edge or serial trigger ends a read cycle and initiates the next read cycle.

In the case of **External Level**, a falling edge trigger ends the read cycle but the next read cycle does not begin until the occurrence of the next rising edge trigger.

Usage: **New Trigger** is an effective way to end a read cycle when objects move past the scanner at irregular intervals (not timing dependent).

Note: When **New Trigger** is enabled and if not in **External Level** mode, **Laser On/Off** will have no effect. When noreads occur, the laser will remain on.

Timeout or New Trigger

Definition: **Timeout or New Trigger** is identical to **Timeout**, except that a timeout *or* a new trigger (whichever occurs first) ends the read cycle.

Usage: Useful in applications that require an alternative way to end the read cycle. For example, if an assembly line should stop completely or the intervals between objects are highly irregular.

Timeout Duration

Definition: **Timeout Duration** is the time span of the read cycle and is represented in 10 mS increments. It is used in conjunction with **External Edge** or **Serial Trigger.**

Usage: It is useful in many tightly controlled applications which require a read cycle to end before the next object appears and therefore need the flexibility of a timeout adjustment.

Serial Cmd: <**K220,***end of read cycle,****timeout duration***>

Default: **100** (Corresponds to one second or 1000 mS.)

Options: 0 to 65535. (Divide any positive number entered by 100 to determine the time in seconds.)

Note: A minimum setting of **2** is recommended.

Note: **Timeout** or **Timeout or New Trigger** under **End of Read Cycle** must be enabled for **Timeout Duration** to take effect.

Multisymbol

Definition: **Multisymbol** allows the user to define up to six bar code symbols that can be read in a single read cycle.

Usage: **Multisymbol** is commonly used in shipping applications where a shipping symbol contains individual symbols for part number, quantity, etc. This feature allows one trigger to pick up all the symbols. AIAG and UCC/EAN- 128 are two application standards that address this need.

Conditions The following conditions apply:

1. All noread messages are posted at the end of the data string.
2. If more than one symbol is within the scan beam at the same time, symbol data may not be displayed in the order of appearance.
3. If **Matchcode Type** is set to **Sequential** or if **Trigger** is set to **Continuous Read 1 Output**, **Number of Symbols** will default to **1** (if set to any number greater than 1).
4. The maximum number of characters in any one bar code (other than PDF417) is **64**.
5. The maximum number of characters in a single scan line is **102** (Code 39).
6. The maximum number of characters for all symbols is **392**, including preamble, separators, and LRC.

Number of Symbols

Definition: **Number of Symbols** is the number of different symbols that can be read in a single read cycle.

Serial Cmd: <**K222,*number of symbols***,*multisymbol separator*>

Default: **1**

Multisymbol Separator

Definition: The character that's inserted between each symbol scanned when **Multisymbol** is set to any number greater than **1**.

Usage: Used to delimit or separate data fields with a user defined character.

Serial Cmd: <**K222,***number of symbols*,***multisymbol separator***>

Note: If **Multisymbol Separator** has been changed to any character other than the default comma and you wish to re-define the separator as a comma, use the embedded menu.

Default: **,** (comma)

Options: Any available ASCII character, except **< > NUL**.

Chapter 5 Symbology

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This section describes the various symbol types that can be read and decoded by the scanner.

Code 39 is enabled by default. To enable all codes, send a **<P>** serial command to the scanner from the Terminal window.[1]

See ***http://www.aimusa.org/standards/aimpubs.htm*** for additional information about symbologies.

Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>** To see all "K" commands, send **<K?>**.

1. If using an I 2/5 symbol, verify that the number of characters in the symbol being scanned matches the code length enabled for the I 2/5 symbol type (default is 10 and 6).

Symbology by Embedded Menu

From the **Main** menu, scroll down through the options until you reach the following screens: **Code Type 1**, **Code Type 2**, and **Code Parameters**, respectively.

CURRENT SETTINGS FOR CODE TYPES 1

	CODE 39	CODE 39	I 2 OF 5	UPC	CODE 128
CODE TYPE	ENABLED	ENABLED	DISABLED	DISABLED	DISABLED
FIXED LENGTH	DISABLED	DISABLED	N/A	N/A	DISABLED
CODE LENGTH 1,2	10, N/A	10 , N/A	10, 6	N/A	10, N/A
CHECK DIGIT	DISABLED	N/A	DISABLED	N/A	N/A
C/D OUTPUT	DISABLED	N/A	DISABLED	N/A	N/A
INTERCHAR GAP	DISABLED	N/A	N/A	N/A	N/A
FULL ASCII	DISABLED	N/A	N/A	N/A	N/A
SUPPLEMENTALS	N/A	N/A	N/A	DISABLED	N/A
EAN	N/A	N/A	N/A	DISABLED	DISABLED
UCC/EAN FORMAT	N/A	N/A	N/A	N/A	STANDARD
SEPARATOR STATUS	N/A	N/A	N/A	DISABLED	DISABLED
SEPARATOR DEFINE	N/A	N/A	N/A		
AP.REC.BRACKETS	N/A	N/A	N/A	N/A	DISABLED
AP.REC.PADDING	N/A	N/A	N/A	N/A	DISABLED

ESC = MAIN MENU OR EXIT N = NEXT ITEM
M = PREVIOUS MENU SP = NEXT ITEM
B = PREVIOUS ITEM CR = THIS ITEM

CODE TYPES 1--> CODE 39

CURRENT SETTINGS FOR CODE TYPES 2

	CODE 93	CODABAR				
CODE TYPE	DISABLED	DISABLED				
FIXED LENGTH	DISABLED	DISABLED				
CODE LENGTH #1	10	10				
CODE LENGTH #2	N/A	N/A				
CHECK DIGIT	N/A	DISABLED				
C/D OUTPUT	N/A	DISABLED				
INTERCHAR GAP	N/A	DISABLED				
S/S MATCH	N/A	ENABLED				
S/S OUTPUT	N/A	ENABLED				

CURRENT SETTINGS FOR GLOBAL CODE PARAMETERS

```
NARROW MARGINS    = DISABLED
SYMBOLOGY ID      = DISABLED
BACKGROUND COLOR  = WHITE
AIAG              = DISABLED
 ID1   = N        = ENABLED
 ID2   = P        = DISABLED
 ID3   = Q        = DISABLED
 ID4   = V        = DISABLED
 ID5              = DISABLED  ID5a = S      ID5b = M      ID5c = G
 ID6   = H        = DISABLED
 ID7   = EZ       = DISABLED
 ID8   = EB       = DISABLED
 ID9   = ED       = DISABLED
 ID10  = EC       = DISABLED
 ID11  = EL       = DISABLED
 ID12  = EX       = DISABLED
```

Symbology by Serial Command

Command Title	Format
Narrow Margins/ Symbology ID	<**K450,***narrow margins status,symbology ID status*>
Background Color	<**K451,***background color*>
Code 39	<**K470,***status,check digit status,check digit output status,large inter-character gap,fixed code length status,fixed code length,full ASCII*>
Codabar	<**K471,***status,start & stop match status,start & stop output status,large intercharacter gap,fixed code length status,fixed code length,check digit type,check digit output*>
Interleaved 2 of 5	<**K472,***status,check digit,check digit output,length 1,length 2*>
UPC/EAN	<**K473,***status,EAN status,supplementals status,separator status,separator character,supplementals type*>
Code 128	<**K474,***status,fixed symbol length status,symbol length...*>
UCC/EAN-128	<**K474,,,,***UCC/EAN-128 status,output format,application record separator status,application record separator character,application record brackets,application record padding*>
Code 93	<**K475,***status,fixed code length status,fixed code length*>
Pharmacode	<**K477,***fixed bar length status,fixed bar length,min. no. of bars,bar widths,forward/reverse*>

Autodiscriminate

Although **Autodiscriminate** is not a configuration command, but it is included here as a convenient tool for enabling most symbol types.

Definition: Enables all available symbology types except PDF417, UCC/EAN 128. The user may also individually disable/enable each symbology type.

Usage: Commonly used for quick setup mode to detect symbol type. This is particularly useful for users who might be unfamiliar with their application's symbology.

Note: It does not alter individual fields such as **Start/Stop**, **Fixed Length**, etc. These need to be setup individually.

Serial Cmd: **<P>**

Default: **Code 39** (only)

Options: <P> Enables all codes except noted above.

<Q> Enable Code 39 only

<R> Enable Codabar only

<S> Enable I 2/5 only

Note: If using an I 2/5 symbol, verify that the number of characters in the symbol being scanned matches the symbol length enabled for the I 2/5 symbol type (default is 10 and 6).

Narrow Margins

Definition: Allows the scanner to read symbols with quiet zones less than 8 times the width of the narrow bar element. “Quiet zone” is the space at the leading and trailing ends of a symbol. Each quiet zone can be as narrow as only five times the width of the narrow bar element when **Narrow Margins** is enabled.

Usage: Used when the leading and trailing edges of the symbols are smaller than the standard margin or when other objects encroach into the margins.

Serial Cmd: <**K450,*narrow margins status***,*symbology id status*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Note: Do not use **Narrow Margins** with **Large Intercharacter Gap** enabled in Code 39 or Codabar.

Symbology ID

Definition: Symbology ID is an AIM standard prefix set of characters that identify the symbol type.

When enabled, the reader analyzes and identifies the symbology and adds a three character identifying prefix to the data:

1. **]** (close bracket character) indicating the presence of a symbology ID
2. **A, C, E, I, L, Q, b, d, p**
   A = Code 39; C = Code 128 or UCC/EAN-128; E = UPC/EAN; I = I–2/5; p = Pharmacode
3. **Modifier** (see Explanation of Modifiers below)

Usage: Used when the symbology type and how it's decoded needs to be known.

Serial Cmd: <**K450,***narrow margins,**symbology identifier status***>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Explanation of Modifiers for Code 39, Codabar, and I–2/5

- For Code 39, Codabar and I–2/5, the modifier indicates **Check Digit** and **Check Digit Output** status.
- For Code 39 only, **Full ASCII** needs to be enabled to see modifiers **4**, **5**, and **7**.

Modifier	Check Digit	Check Digit Output	Full ASCII conversion performed (Code 39 only)
0	Disabled	N/A	No
1	Enabled	Enabled	No
3	Enabled	Disabled	No
4	Disabled	N/A	Yes
5	Enabled	Enabled	Yes
7	Enabled	Disabled	Yes

Example: **]A5** indicates a Code 39 symbol with **Check Digit** and **Check Digit Output** enabled and Full ASCII conversion performed.

For Other Codes

- For Code 128, a **1** indicates ECC/EAN-128; otherwise the modifier is a **0**.
- For all other codes, the modifier is **0**.

Background Color

Definition:	Allows the user to choose which symbol background (spaces and surrounding medium) the scanner can read.
Usage:	If the background is darker than the symbol, then enable black background. Typically the background is white; but on PCBs for example, they can be black.
Serial Cmd:	<**K451,*background color***>
Default:	**White**
Options:	0 = White 1 = Black

Code 39

Definition: An alphanumeric symbol with unique start/stop symbol patterns, composed of 9 black and white elements per character, of which 3 are wide.

Usage: **Code 39** is considered the standard for non-retail symbology.

Code 39 Status

Serial Cmd: <**K470,*status***,*check digit status,check digit output,large intercharacter gap,fixed symbol length status,fixed symbol length,full ASCII set*>

Default: **Enabled**

Note: This is the only symbol type enabled by default.

Options: 0 = Disabled 1 = Enabled

Check Digit Status (Code 39)

Serial Cmd: <**K470,***status,**check digit status***,check digit output,large intercharacter gap,fixed symbol length status,fixed symbol length,full ASCII set*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Check Digit Output (Code 39)

Definition: When enabled, the check digit character is read and compared along with the symbol data. When disabled, symbol data is sent without the check digit.

Note: With **Check Digit Output** and an **External** or **Serial** trigger option enabled, an invalid check digit calculation will cause a noread message to be transmitted at the end of the read cycle.

Usage: **Check digit Output**, added to the symbol, provides additional security.

Serial Cmd: <**K470,***status,check digit status*,***check digit output***,*large intercharacter gap,fixed symbol length status,fixed symbol length,full ASCII set*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Large Intercharacter Gap (Code 39)

Definition: When enabled, the scanner can read symbols with gaps between symbol characters that exceed three times (3x) the narrow element width.

Usage: **Large Intercharacter Gap** is helpful for reading symbols that are printed out of specification.

Caution: Do not use **Large Intercharacter Gap** with **Narrow Margins** enabled since a large intercharacter gap (over 3x) could cause a narrow margins (5x) to be interpreted as an intercharacter gap.

Serial Cmd: *<**K470,**status,check digit status,check digit output,**large intercharacter gap**,fixed symbol length status,fixed symbol length,full ASCII set>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Symbol Length Status (Symbol 39)

Definition: When enabled, the scanner will check the symbol length against the symbol length field. If disabled, any length would be considered a valid symbol.

Serial Cmd: *<**K470,**status,check digit status,check digit output,large intercharacter gap,**fixed symbol length status**,fixed symbol length,full ASCII set>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Symbol Length (Code 39)

Definition: Specifies the exact number of characters that the scanner will recognize (this does not include start and stop and check digit characters). The scanner ignores any symbol not having the specified length.

Usage: **Fixed symbol Length** helps prevent truncations and increases data integrity by ensuring that only one symbol length will be accepted.

Serial Cmd: *<**K470,**status,check digit status,check digit output,large intercharacter gap,fixed symbol length status,**fixed symbol length**,full ASCII set>*

Default: **10**

Full ASCII Set (Code 39)

Definition: Standard Code 39 encodes 43 characters; zero through nine, capital “A” through capital “Z”, minus symbol, plus symbol, forward slash, space, decimal point, dollar sign and percent symbol. When **Full ASCII Set** is enabled, the scanner can read the full ASCII character set, from 0 to 255.

Usage: Must be enabled when reading characters outside the standard character set (0-9, A-Z, etc.)

User must know in advance whether or not to use **Full ASCII Set** option. Since **Full ASCII Set** requires two code words to encode one character, it is less efficient.

Serial Cmd: <**K470,***status,check digit status,check digit output,large intercharacter gap,fixed code length status,fixed code length,**full ASCII set*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Codabar

Definition: Codabar is a 16-character set (0 through 9, and the characters $, :, /, ., +, and –) with start/stop codes and at least two distinctly different bar widths.

Usage: Used in photo-finishing and library applications. Formerly used in some medical applications but not typically used in newer applications.

Codabar Status

Serial Cmd: <**K471,*status***,*start & stop match,start & stop match output,large intercharacter gap,fixed symbol length status,fixed symbol length,check digit type,check digit output*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Start & Stop Match (Codabar)

Definition: Requires the Codabar start and stop characters (a, b, c, or d) to match before a valid read can occur.

Usage: Used to increase security of symbology.

Serial Cmd: <**K471,***status*,***start & stop match***,*start & stop match output,large intercharacter gap,fixed symbol length status,fixed symbol length,check digit type,check digit output*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Start & Stop Output (Codabar)

Definition: Causes the start and stop characters to be transmitted with symbol data.

Usage: Used to verify matching.

Serial Cmd: <**K471,***status,start & stop match*,***start & stop match output***,*large intercharacter gap,fixed symbol length status,fixed symbol length,check digit type,check digit output*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Large Intercharacter Gap (Codabar)

Definition: Instructs the scanner to read symbols with gaps between characters exceeding three times the narrow element width.

Usage: It is helpful for reading symbols that are printed out of specification.

Caution: Do not use **Large Intercharacter Gap** with **Narrow Margins** enabled since enabling **Large Intercharacter Gap** (over 3x) could cause a narrow margins (5x) to be interpreted as an intercharacter gap.

Serial Cmd: <**K471,***status,start & stop match,start & stop output match,**large intercharacter gap**,fixed symbol length status,fixed fixed symbol length,check digit type,check digit output*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Symbol Length Status (Codabar)

Definition: When enabled, the scanner will check the symbol length against the fixed symbol length field. When disabled, any length would be considered a valid symbol.

Serial Cmd: <**K471,***status,start & stop match,start & stop match output,large intercharacter gap,**fixed symbol length status**,fixed symbol length,check digit type,check digit output*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Symbol Length (Codabar)

Definition: Specifies the exact number of characters that the scanner will recognize (this does not include start and stop and check digit characters). The scanner ignores any symbol not having the specified length.

Usage: **Fixed Symbol Length** helps prevent truncations and increases data integrity by ensuring that only one symbol length will be accepted.

Serial Cmd: <**K471,***status,start & stop match,start & stop match output,large intercharacter gap,fixed symbol length status,**fixed symbol length**,check digit type,check digit output*>

Default: **10**

Options: 1 to 64

Note: **Fixed Symbol Length Status** must be enabled for **Fixed Symbol Length** to take effect.

Note: Because of symbology limitations, setting **Symbol Length** to any number less than four will produce undetermined results.

Check Digit Type (Codabar)

Definition: Allows the user to select the check digit type Codabar will use.

Serial Cmd: <**K471,***status,start & stop match,start & stop match output,large intercharacter gap,fixed symbol length status,fixed symbol length,**check digit type**,check digit output*>

Default: **Disabled**

Options: 0 = Disabled
1 = Modulus 16
2 = NW 7
3 = Both

Modulus 16: Used in the photo-finishing market.

NW 7: Used in Japanese markets.

Check Digit Output (Codabar)

Definition: When enabled, the check digit character is sent along with the symbol data. When disabled, symbol data is sent without the check digit.

Usage: For additional security a check digit can be added to the symbol.

Serial Cmd: <**K471,***status,start & stop match,start & stop match output,large intercharacter gap,fixed symbol length status,fixed symbol length,check digit type,**check digit output***>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Interleaved 2 of 5

Definition: A dense, continuous, self-checking, numeric symbology. Characters are paired together so that each character has five elements, two wide and three narrow, representing numbers 0 through 9, with the bars representing the first character and the interleaved spaces representing the second character. (A check digit is highly recommended.)

Important: You must set **Symbol Length** in order to decode I 2/5 symbols.

Usage: It is has been popular because it is the most dense symbol for printing numeric characters less than 10 characters in length; however Microscan does not recommend this symbology for any new applications because of inherent problems such as truncation.

Interleaved 2 of 5 Status

Serial Cmd: <**K472,*status***,*check digit status,check digit output,symbol length #1,symbol length #2*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Check Digit Status (Interleaved 2 of 5)

Definition: An error correcting routine in which the check digit character is added.

Usage: It is typically not used but can be enabled for additional security in applications where the host requires redundant check digit verification.

Serial Cmd: <**K472,***status*,***check digit status***,*check digit output,symbol length #1,symbol length #2*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Check Digit Output (Interleaved 2 of 5)

Definition: When enabled, a check digit character is sent along with the bar symbol data for added data security.

Serial Cmd: <**K472,***status,check digit status,***check digit output***,symbol length #1,symbol length #2>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Symbol Length #1 (Interleaved 2 of 5)

Definition: Allows user to define the symbol length. Because I 2/5 is a continuous symbol, it is prone to substitution errors. Hence, a symbol length must be defined and a bar symbol must contain an even number of digits.

Note: If start, stop or check digits are used, they are not included in the symbol length count.

Usage: With I 2/5, two symbol lengths can be defined. When using only one symbol length in an application, setting **Symbol Length #2** to 0 (zero) to ensure data integrity is recommended.

Serial Cmd: <**K472,***status,check digit status,check digit output,***symbol length #1***,symbol length #2>*

Default: **10**

Options: 2 to 64

Since I 2/5 characters are paired, symbol length must be set to an even number. If **Check Digit** is enabled, add 2 to your symbol length. For example, if your symbol is 10 characters plus a check digit, then enable **Symbol Length** for 12.

Note: Typically, when printing an I 2/5 symbol with an odd number of digits, a 0 will be added as the first character.

Symbol Length #2 (Interleaved 2 of 5)

Definition: Allows user to define a second symbol length for I–2 of 5.

Usage: If using a second symbol, a zero or any even symbol length from 2 to 64 may be specified. If not using a second symbol, set Symbol Length #2 to 0 to ensure data integrity.

Serial Cmd: <**K472,***status,check digit status,check digit output,symbol length #1,**symbol length #2***>

Default: **6**

Options: 2 to 64

Since I 2/5 characters are paired, symbol length must be set to an even number. If **Check Digit** is enabled, add 2 to your symbol length. For example, if your symbol is 10 characters plus a check digit, then enable **Symbol Length** for 12.

Note: Typically, when printing an I 2/5 symbol with an odd number of digits, a 0 will be added as the first character.

UPC/EAN

Definition: UPC (Universal Product Code) is a fixed length numeric, continuous symbology. UPC can have two- or five-digit supplemental bar code data following the normal code. The U.P.C., Version A (U.P.C., A) symbol is used to encode a 12 digit number. The first digit is the number system character, the next five are the manufacturer number, the next five are the product number, and the last digit is the checksum character.

When enabled, the scanner will read UPC version A and UPC version E only.

Usage: Used primarily in POS application in the retail industry. It is commonly used with Microscan scanners in applications in combination with **Matchcode** when there is a need to verify that the right product is being placed in the right packaging.

UPC Status

Serial Cmd: *<**K473,UPC status**,EAN status,supplementals status,separator status,separator character,supplementals type>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

EAN Status

Definition: EAN is a subset of UPC. When enabled, the scanner will read UPC version A, UPC version E, EAN 13, and EAN 8. It also appends a leading zero to UPC version A symbol information and transmits 13 digits. If transmitting 13 digits when reading UPC version A symbols is not desired, disable **EAN**.

Note: The extra character identifies the country of origin.

Usage: **EAN** is the European version of the UPC symbology and is used in European market applications.

Serial Cmd: *<**K473,**UPC status,**EAN status**,supplementals status,separator status,separator character,supplementals type>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Note: **UPC** must be enabled for **EAN** to take effect.

Supplementals Status (UPC/EAN)

Definition: A supplemental is a 2 or 5 digit symbol appended to the main symbol. When set to **Enabled** or **Required**, the scanner reads supplemental bar code data that has been appended to the standard UPC or EAN codes.

Usage: Reads **Supplementals** typically used in publications and documentation.

Serial Cmd: <**K473,***UPC status,EAN status,**supplementals status**,separator status, separator character,supplementals type*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled 2 = Required

Disabled: UPC **Supplementals** will not be decoded.

Enabled: When enabled, the scanner will try to decode a main and a supplemental. However, if a supplemental is not decoded, at the end of the read cycle, the main will be sent by itself. The UPC main and supplemental symbols are considered to be one symbol and will be treated as such.

Required: When set to **Required** and either the main or supplemental symbol is not read, a single noread condition results. The UPC main and supplemental symbols are treated as one symbol.

For example, if **Supplementals** is set to **Required**, **Separator** is enabled, and an asterisk is defined as the UPC separator character, then the data will be displayed as: MAIN * SUPPLEMENTAL.

Note: Under no circumstances will supplemental symbol data be sent without a main symbol.

Note: If additional symbols—other than the main or supplemental—will be read in the same read cycle, **Number of symbols** should be set accordingly.

Separator Status (UPC/EAN)

Definition: Allows the user to insert a character between the standard UPC or EAN code and the supplemental code when **Supplementals** is set to **Enabled** or **Required**.

Usage: Allows user to distinguish between the main and **Supplemental** symbols.

Serial Cmd: <**K473,***UPC status,EAN status,supplementals status,**separator status**,separator character,supplementals type*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Separator Character (UPC/EAN)

Note: If **Separator Character** has been changed to any other character and you wish to re-define the separator as a comma, you will need to use ESP or the embedded menu.

Definition: Allows the user to change the separator character from a comma to a new character.
Usage: As required by the application.
Serial Cmd: <**K473,***UPC status,EAN status,supplementals status,separator status,**separator character**,supplementals type*>
Default: **,** (**comma**)
Options: Any ASCII character

Note: Whenever **Separator Character** is defined as a comma (,) sending a <**K473,s?**> command will return the current settings including the separator character comma which appears after the separator status comma.

Supplementals Type (UPC/EAN)

Definition: Allows the user to select 2 character or 5 character supplements, or both.
Usage: As required by symbology used in application.
Serial Cmd: <**K473,***UPC status,EAN status,supplementals status,separator status,separator character,**supplemental type***>
Default: **Both**
Options: 0 = Both
1 = 2 char only
2 = 5 char only
Both: Either 2 character or 5 character supplementals will be considered valid.
2 Char Only: Only two character supplementals will be considered valid.
5 Char Only: Only five character supplementals will be considered valid.

Code 128

Definition: A very dense alphanumeric symbology. It encodes all 128 ASCII characters; it is continuous, has variable length, and uses multiple element widths measured edge to edge.

Usage: **Code 128** is useful in applications with tight spots and high security needs.

Code 128 Status

Serial Cmd: <**K474,*status***,*fixed symbol length status,fixed symbol length*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Symbol Length Status (Code 128)

Definition: When enabled, the scanner will check the symbol length against the symbol length field. When disabled, any length would be considered a valid symbol.

Serial Cmd: <**K474,***status*,***fixed symbol length status***,*fixed symbol length*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Symbol Length (Code 128)

Definition: Specifies the exact number of characters that the scanner will recognize (this does not include start and stop and check digit characters). The scanner ignores any symbol not having the specified length.

Usage: **Fixed Symbol Length** helps prevent truncations and increases data integrity by ensuring that only one symbol length will be accepted.

Serial Cmd: <**K474,***status,fixed symbol length status,****fixed symbol length***>

Default: **10**

Options: 1 to 64

Note: Fixed Symbol Length Status must be enabled for **Fixed Symbol Length** to take effect.

UCC/EAN-128

Note: Code 128 must be **Enabled** for UCC/EAN-128 to function.

Definition: A subset of Code 128, with extended features. (See the Uniform Code Council, Inc. at ***www.uc-council.org***.)

Usage: Used as a standard for shipping symbols.

UCC/EAN-128 Status

Serial Cmd: <**K474,,,,*UCC/EAN-128 status***,*output format,application record separator status,application record separator character,application record brackets,application record padding*>

Note: Code 128 serial command fields for K474 precede UCC/EAN-128.

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled 2 = Required

If set to **Enabled,** symbols can be read with or without a function 1 character in the first position.

If set to **Required,** the symbol must have a function 1 in the first position and conform to EAN format in order to decode the bar code symbol.

Output Data Format (UCC/EAN-128)

Definition: Offers an option between **Standard UCC/EAN-128** and **Application Record** format.

Usage: **Application Record** is useful in applications in which the software can utilize application record formatting to help automate the processing of its UCC/EAN-128 data.

Serial Cmd: <**K474,,,,***UCC/EAN-128 status,****output format****,application record separator status,application record separator character,application record brackets,application record padding*>

Default: **Standard**

Options: 0 = Standard 1 = Application Record

In **Standard** UCC/EAN-128 application identifiers and data fields are sent, but none of the formatting (separators, parentheses, padding) will be included.

Application Record is a variation of UCC/EAN-128 that allows the user to define separators between data fields, enclose application identifiers in parentheses, and enable padding (zeros) for variable length fields.

Note: If an illegal **Application Record** format is detected, the scanner will process it as a noread and output a noread message (if enabled).

Application Record Separator Status (UCC/EAN-128)

Definition: When enabled, a separator character is inserted between application records.

Serial Cmd: <**K474,**,,,*UCC/EAN-128 status,output format,***application record separator status,***application record separator character,application record brackets,application record padding>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Note: **Output Format** must be set to **Application Record** before this parameter can take effect.

Application Record Separator Character (UCC/EAN-128)

Definition: Allows the user to define an ASCII character as an application record separator.

Serial Cmd: <**K474,**,,,*UCC/EAN-128 status,output format,application record separator status,***application record separator character***,application record brackets,application record padding>*

Default: **,** (comma)

Options: User Defined ASCII character

Note: **Output Format** must be set to **Application Record** before this parameter can take effect.

Application Record Brackets (UCC/EAN-128)

Definition: When enabled, parentheses ( ) are added to enclose application identifiers.

Serial Cmd: <**K474,**,,,*UCC/EAN-128 status,output format,application record separator status,application record separator character,***application record brackets***,application record padding>*

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Note: **Output Format** must be set to **Application Record** before this parameter can take effect.

Application Record Padding (UCC/EAN-128)

Definition: Padding is the insertion of zeros to make up the maximum length of a variable application record data field, except for the last field which does not require padding.

When enabled, padding is included. When disabled, padding is omitted.

Note: Padding is never added to fixed length fields or to the last data field of a symbol. Enabling or disabling **Record Padding** will have no effect on these.

Serial Cmd: <**K474,**,,,*UCC/EAN-128 status,output format,application record separator status,application record separator character,application record brackets,****application record padding***>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Note: **Output Format** must be set to **Application Record** before this parameter can take effect.

Code 93

Definition: Code 93 is a variable length, continuous symbology employing four element widths. Each Code 93 character has nine modules that may be either black or white. Each character contains three bars and three spaces.

Usage: Used occasionally in clinical industry.

Code 93 Status

Serial Cmd: <**K475,*status***,*fixed code length status,fixed code length*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Code Length Status (Code 93)

Definition: When enabled, the scanner will check the symbol length against the code length field. When disabled, any length would be considered a valid symbol.

Serial Cmd: <**K475,***status*,***fixed code length status***,*fixed code length*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Code Length (Code 93)

Definition: Specifies the exact number of characters that the scanner will recognize (this does not include start and stop and check digit characters). The scanner ignores any code not having the specified length.

Usage: **Fixed Code Length** helps prevent truncations and increases data integrity by ensuring that only one symbol length will be accepted.

Serial Cmd: <**K475,***status,fixed code length status,****fixed code length***>

Default: **10**

Options: 1 to 64

Pharmacode

Definition: The bar code encodes up to five different numbers, each with its own color which may be entered in decimal or "binary" format with a 1 represented by a thick bar and a 0 represented by a thin bar. Bar width is independent of height.

In decimal format, each part can be up to 999999.

In binary format, each input have up to 19 ones and zeros.

Usage: Pharmacode is used mostly with packaging for the pharmaceuticals industry.

Note: It is recommended that you disable AGC before enabling Pharmacode.

Pharmacode Status

Serial Cmd: <**K477,*status***,*fixed bar length status,fixed bar length,min. no. of bars,bar widths,forward/reverse*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Bar Length Status (Pharmacode)

Serial Cmd: <**K477,***status,**fixed bar length status***,*fixed bar length,min. no. of bars,bar widths,forward/reverse*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Fixed Bar Length (Pharmacode)

Serial Cmd: <**K477,***status,fixed bar length status,**fixed bar length***,*min. no. of bars,bar widths,forward/reverse*>

Default: **10**

Options: 5 to 16

Minimum Number of Bars (Pharmacode)

Serial Cmd: <**K477,***status,fixed bar length status,fixed bar length,**min. no. of bars***,*bar widths,forward/reverse*>

Default: **5**

Options: 5 to 16

Bar Widths (Pharmacode)

Serial Cmd: <**K477,***status,fixed bar length status,fixed bar length,min. no. of bars,* ***bar widths****,forward/reverse>*

Default: **Mixed**

Options: 0 = Mixed 1 = Narrow 2 = Wide

Forward/Reverse Decoding Direction (Pharmacode)

Definition: Specifies the direction that a bar can be read.

Serial Cmd: <**K477,***status,fixed bar length status,fixed bar length,min. no. of bars, bar widths,* ***forward/reverse****>*

Default: **Forward**

Options: 0 = Forward 1 = Reverse

Chapter

6

Matchcode

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This section explains the matchcode output functions and the master symbol database setup.

Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>** To see all “K” commands, send **<K?>**.

Matchcode by Serial Command

Command Title	Format
Master symbol database size	<**K224,***number of master symbols*>
Matchcode Enable	<**K223,***status*>
Matchcode Type	<**K223,***type,sequential matching,match start position,match length,wild card character, sequence on noread,sequence on mismatch*>
New Master Pin	<**K225,***status*>
Enter data to database	<**K231,***master symbol number,master symbol data*>
Request all Master Symbol information	<**K231,?**>
Request Master Symbol information	<**K231,***master symbol number***?**>
Delete Master Symbol	<**K231,***master symbol number***,**>

(See also "Master Symbol Database" on page 6-11.)

Matchcode by Embedded Menu

For information on accessing the embedded menus, see “Embedded Menus” on page A-22.

From the **Main** menu, scroll down through the options and select the following screen:

CURRENT SETTINGS FOR OPERATIONS
TRIGGERING MODE = SERIAL DATA
END OF READ CYCLE = TIMEOUT
TIMEOUT in 10ms incs = 1000 mS
TRIGGER CHARACTER = <SPC>
EXTERNAL TRIGGER = N/A
TRIGGER FILTER = 9984 us
GOOD DECODE READS = 1
NEW MASTER PIN = DISABLED
NUMBER OF LABELS = 1
MULTILABEL SEPARATOR = ,
CONSECUTIVE GDR = DISABLED
ASCII START CHARACTER= <NUL>
ASCII END CHARACTER = <NUL>
MATCHCODE TYPE = DISABLED
SEQUENTIAL MATCHING = INCREMENT
MATCH START POSITION = 0
MATCH LENGTH = 1
WILD CARD CHARACTER = *
SEQUENCE ON NOREAD = ENABLED
SEQUENCE ON MISMATCH = DISABLED
MATCH DATABASE SIZE = 1
ESC = MAIN MENU OR EXIT
M = PREVIOUS MENU
B = PREVIOUS ITEM
N = NEXT ITEM
SP = NEXT ITEM
CR = THIS ITEM
OPERATIONS--> TRIGGERING MODE = SERIAL DATA_

Overview of Matchcode

Definition: With **Matchcode** you can store master symbol data in the scanner's memory, compare this data against the scanned bar codes, and define how symbol data and/or discrete signal output will be directed. A master symbol database can be set up for up to 10 master symbols. See "Master Symbol Database" on page 6-11.

Usage: **Matchcode** is used in applications to sort, route, or verify data based on matching the specific bar code symbol in a variety of ways as defined in this section. For example, a manufacturer might sort a product based on dates that are embedded in the bar code.

Using Master Symbols

1. Set **Triggering Mode** to **External** or **Serial** (see "Trigger Mode" on page 4-4).
2. Chose the method of symbol comparison that fits your application (see "Matchcode Type" on page 6-6).
3. Enable Matchcode (see "Matchcode" on page 7-6).
4. Define the output you want with your matchcode setup:
   a) Symbol output ("Symbol Output Status" on page 8-4).
   b) Discrete output (see Chapter 8, "Output Conditions")).
5. Select the number of master symbols you want to create, if more than one (see "Master Symbol Database Overview" on page 6-11).
6. Enter master symbol data in one of the following ways:
   a) Use **ESP** to type in master symbol data directly into the **Utilities** menu.
   b) Send a serial command with symbol data in the form of ***<M master symbol#,data>*** (or ***<)data)>*** for single master symbol only).
   c) Send a ***<G master symbol number>*** command to scan next symbol in as the master symbol.
   d) Enable the **New Master Pin** command and activate a discrete input to store the next symbol scanned as the master symbol (see "New Master Pin" on page 6-14).Other Master Symbol Serial Commands

See also "Master Symbol Database" on page 6-11 for more information details on entering, requesting, and deleting master symbols.

Matchcode Type

Note: When **Matchcode** is set to **Enabled**, **Wild Card** or **Sequential**, **Number of Symbols** will default back to **1** (if set to any number greater than 1).

Definition: Allows the user to choose the way that master symbols will be compared with subsequently scanned symbols.

Note: First set **Triggering Mode** to **External** or **Serial**.

Serial Cmd: <**K223,*matchcode type***,*sequential matching,match start position, match length,wild card character,sequence on noread,sequence on mismatch*>

Default: **Disabled**

Options: 0 = Disabled

1 = Enabled

2 = Sequential

3 = Wild Card

Disabled: Has no effect on operations.

Enabled: Instructs the scanner to compare symbols or portions of symbols with the master symbol.

Sequential Matching: Instructs the scanner to sequence after each match (numeric only) and compare symbols or portions of symbols for sequential numbers.

Note: If **Matchcode Type** is set to **Sequential**, **Number of Symbols** will default back to **1** (if set to any number greater than 1).

Wild Card: Allows the user to enter user defined wild card characters in the master symbol.

Sequential Matching

Definition: With **Sequential** enabled, **Sequential Matching** determines if a count is in ascending (incremental) or descending (decremental) order.

Usage: Useful in tracking product serial numbers that increment or decrement sequentially.

Serial Cmd: <**K223,***matchcode type*,***sequential matching***,*match start position, match length,wild card character,sequence on noread,sequence on mismatch*>

Default: **Increment**

Options: 0 = Increment 1 = Decrement

Match Start Position

Definition: **Match Start Position** determines the portions of symbols that will be matched by defining the first character in the symbol (from left to right) that will be compared with those of the master symbol, when **Matchcode Type** is set to **Enabled** or **Sequential**.

Function: For example, if **Match Start Position** is set to 3, the first 2 characters read in the symbol will be ignored and only the 3rd and subsequent characters to the right will be compared, up to the number of characters specified by **Match Length**.

Usage: **Match Start Position** is useful in defining specific portions of a symbol for comparisons. For example, if a symbol contains a part number, manufacturing date, and lot code info but the user is only interested in the part number information, **Match Start Position** can be set to only sort on the part number and ignore the rest of the characters.

Serial Cmd: *<**K223,**matchcode type,sequential matching,**match start position**, match length,wild card character,sequence on noread,sequence on mismatch>*

Default: **0**

Options: 0 to 50

Note: **Match Start Position** must be set to **1** or greater to enable this feature. A **0** setting will disable this feature.

Match Length

Definition: Defines the length of the character string that will be compared with that of the master symbol when **Match Start Position** is set to **1** or greater. When **Match Start Position** is set to **0**, no comparison will occur.

Usage: For example, if **Match Length** is set to **6** in a 10 character symbol, and **Match Start Position** is set for **2**, only the 2nd through 7th characters (from left to right) will be compared.

Serial Cmd: *<**K223,**matchcode type,sequential matching,match start position, **match length**,wild card character,sequence on noread,sequence on mismatch>*

Default: **1**

Options: 1 to 50

The maximum character length for master symbols is 128. When more than one master symbol is enabled, the maximum number for each additional symbol diminishes as shown here:

# of Symbols:	1	2	3	4	5	6	7	8	9	10
Maximum characters:	128	64	42	32	25	21	18	16	14	12

Wild Card Character

Definition: **Wild Card Character** allows a user to define a wild card character as part of the master symbol.

Usage: For example, with **Wild Card Character** defined as the default asterisk, defining **CR*34** as the master symbol will result in matches for CR**1**34, CR**2**34, but not CR2345. Entering the wild card at the end of the master symbol as in **CR*** will result in matches for variable symbol lengths such as CR**1**, CR**23**, CR**358**, etc.

Serial Cmd: <**K223,***matchcode type,sequential matching,match start position, match length,**wild card character**,sequence on noread,sequence on mismatch*>

Default: ***** (asterisk)

Options: Any valid ASCII character

Sequence On Noread

Definition: When **Sequence On Noread** is **Enabled** and **Matchcode** is set to **Sequential**, the scanner sequences the master symbol on every match or noread. When disabled, it does not sequence on a noread.

Usage: **Sequence On Noread** is useful when the scanner needs to stay in sequence even if no decode occurs.

Serial Cmd: *<**K223,**matchcode type,sequential matching,match start position, match length,wild card character,**sequence on noread**,sequence on mismatch>*

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

As an example of **Sequence on Noread Enabled**, consider the following series of decodes:

Master symbol	Decoded symbol	Master symbol after decode
001	001	002
002	002	003
003	noread	004 (sequenced on noread)
004	004	005
005	noread	006 (sequenced on noread)
006	noread	007 (sequenced on noread)
007	007	008

As an example of **Sequence on Noread Disabled**, consider the following series of decodes:

Master symbol	Decoded symbol	Master symbol after decode
001	001	002
002	002	003
003	noread	003 (not sequenced)
003	003	004
004	noread	004 (not sequenced)
004	noread	004 (not sequenced)
004	004	005

Sequence On Mismatch

Note: **Matchcode** must be set to **Sequential** for this command to function.

Definition: When set to **Enabled**, the master symbol sequences on every decode, match or mismatch.

When set to **Disabled**, the master symbol will not sequence whenever consecutive mismatches occur.

Usage: Enable this parameter if every trigger event should have a decode *and* more than one consecutive mismatch may occur.

Disable this parameter if every trigger event should have a decode but no more than one consecutive mismatch may occur.

Serial Cmd: <**K223,***matchcode type,sequential matching,match start position, match length,wild card character,sequence on noread,****sequence on mismatch***>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

The scanner will sequence the master to one more/less than the decoded symbol. As an example of **Sequence On Mismatch Enabled**, consider the following decodes:

Master symbol	Decoded symbol	Master symbol after decode
001	001	002
002	002	003
003	abc	004 (sequenced on mismatch)
004	004	005
005	def	006 (sequenced on mismatch)
006	ghi	007 (sequenced on mismatch)
007	007	008

As an example of **Sequence On Mismatch Disabled**, consider the following decodes:

Master symbol	Decoded symbol	Master symbol after decode
001	001	002
002	002	003
003	abc	004 (sequenced because of previous match)
004	004	005
005	def	006 (sequenced because of previous match)
006	ghi	006 (not sequenced because of previous mismatch)
006	006	007

Master Symbol Database

Important: **Master Symbol Database** is used only for comparing entire bar codes, when **Sequential** and **Wild Card** are NOT enabled, and **Start Position** is equal to **0**.

Master Symbol Database Overview

Definition: Allows you to define up to 10 master symbols as the master symbol database, which can be entered by keyboard, scanned in, displayed, or deleted by serial commands.

Usage: Useful where more than one master symbol is required, as in a **Multi-symbol** setup, for matching and other matchcode operations.

Master Symbol Database Size

Definition: **Master Symbol Database Size** allows you to select 1 to 10 master symbols for the master symbol database.

Serial Cmd: <**K224,*number of master symbols***>

Default: **1**

Options: 1 to 10

Enter Master Symbol Data

Definition: Allows you to enter master symbol data for a specific master symbol index number (1 to 10), provided the index number is not larger than the number of symbols enabled by the **Master Symbol Database Size** (see page 6-11). For example, if **Master Symbol Database Size** is set to 2, you will not be able to enter data for symbols 3 through 10.

Serial Cmd: <**K231,*master symbol number,master symbol data***>

Default: **1, *blank***

Options: 1 to 10, data (any combination of ASCII text up to the maximum indicated in "Maximum Characters for Master Symbol Database" on page 6-12).

For example, to enter data for master symbol 9, after making certain that master symbol database size is enabled for 9 or more symbols (see "Master Symbol Database Size" on page 6-11), send <**K231,*9,data***>.

Caution: Since the total number of characters available for the master symbol database is **128**, changes to the **Master Symbol Database Size** will re-allocate the number of characters available for each master symbol and could cause existing master symbols to be deleted (except master symbol #1 unless it also exceeds the size limitation).

Table 6-1, "Maximum Characters for Master Symbol Database," on page 6-12 specifies the maximum number of characters available to each symbol according to the number of master symbols defined, from 1 through 10. See "Master Symbol Database Size" on page 6-11.

Table 6-1 Maximum Characters for Master Symbol Database

Master Symbol Number	Maximum Characters
#1	128
#2	62
#3	38
#4	28
#5	2

Request Master Symbol Data

Definition: Returns master symbol data for any enabled master symbols from 1 to 10.

For example, to request master symbol #5, enter **<K231,5?>**. The scanner transmits master symbol #5 data in brackets in the following format:
<5/*data*>. If no master symbol data available, the output will be: <5/>.

Serial Cmd: Send <**K231,*master symbol number?***> to request the current master symbol for a specific master symbol.

Returns all master symbols if no number is added before the question mark.

Caution: Be sure to add the **?** or you will delete the master symbol(s).

Options: 1 to 10

Delete Master Symbol Data

Definition: **Delete Master Symbol Data** allows you to delete an enabled master symbol.

Serial Cmd: Send <**K231,*master symbol number,***> to delete the master symbol.

Options: 1 to 10

Store Next Symbol Scanned as Master Symbol

Definition: After you've set the size in the database, you can order the scanner to scan-in the next symbol as the master symbol for any given master symbol number.

Serial Cmd: <**G*master symbol number***>

To store the next symbol scanned as master symbol #1 send: <G> or <G1>. For all symbols numbers except 1, the number must be included.

Options: 1 to 10

New Master Pin

Definition: After **New Master Pin** is enabled, a pulse can be received on the new master pin which will cause the scanner to record the next decoded bar code symbol(s) as the new master symbol(s).

It is important to note that the enabling **New Master Pin** does not in itself cause a master symbol to be recorded. The master pin must then be activated momentarily (for a minimum of 10 ms) before a master symbol can be scanned into memory. (See "© Microscan Systems, Inc. Specifications subject to change.Electrical Specifications" on page A-3.)

Usage: Some applications require the line worker to change the master symbol. This can be done by installing a switch at the location of the scanner. It is very common to have a keyed switch so that accidental switching does not occur.

Serial Cmd: <**K225,*status***>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

After **New Master Pin** has been enabled and the pin activated, decodes will be saved in the master database beginning with master symbol #1. If the scanner is configured for a multisymbol read cycle (**Number of Symbols** is greater than 1), the remaining decodes will be saved in each consecutive master symbol location. For example, if **Number of Symbols** is set to **3** and **New Master Pin** is then activated, at the end of the next read cycle, the decoded bar code symbols will be saved as master symbols 1, 2, and 3.

Chapter

7

Scanner Setup

Chapter Contents

Scan Speed 7-4
Laser On/Off Status 7-5
Laser Framing 7-6
Laser Power 7-9
Automatic Gain Control 7-10
Transition Counter 7-12
Bar Detection 7-13

This section includes general scanner setup relating to the specific needs of the scanning application and environment.

Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>** To see all “K” commands, send **<K?>**.

Scanner Setup by Serial Command

Command Title	Format
Scan Speed	<**K500,***scan speed*>
Laser Controls	<**K700,***laser on/off status,laser framing status,laser on position,laser off position,laser power*>
Automatic Gain Control	<**K504,***gain adjustment,AGC sampling,AGC min,AGC max*>
Transition Counter	<**K505,***transition counter status,transition counter threshold*>
Bar Detection	<**K502,***(not used),minimum symbol transitions,maximum element*>

Scanner Setup by Embedded Menu

For information on accessing the embedded menus, see “Embedded Menus” on page A-22.

From the **Main** menu, scroll down through the options and select the following screen:

```
                    CURRENT SETTINGS FOR SCANNER SETUP
-------------------------------------------------------------------------------
SCANNER TYPE              = STANDARD/LOW
GAIN ADJUSTMENT           =  90
-------------------------------------------------------------------------------
AGC SAMPLING            = LEADING EDGE
SCANS PER SECOND        =  700
SCAN WIDTH ADJUST       = DISABLED
LASER POWER USED        =  LOW
TRANSITION COUNTER      = DISABLED
MIN LABEL TRANSITIONS   =  14
BAD BARCODE OUTPUT      = DISABLED
BAD BARCODE MESSAGE     = BADCODE
NO BARCODE OUTPUT       = DISABLED
NO BARCODE MESSAGE      = NOLABEL
-------------------------------------------------------------------------------
          ESC = MAIN MENU OR EXIT    N  = NEXT ITEM
          M   = PREVIOUS MENU        SP = NEXT ITEM
          B   = PREVIOUS ITEM        CR = THIS ITEM
-------------------------------------------------------------------------------
SCANNER SETUP--> SCANNER TYPE     = STANDARD/LOW_
```

Scan Speed

(factory setting)

Definition: Allows the user to set the number of scans per second by controlling the spinning mirror motor speed.

Usage: To ensure a minimum number of scans, faster scan speeds are typically used for fast moving symbols and/or longer symbols with larger bar widths. See **"Formulas for Number of Decodes" on page A-27**.

Note: Scan beams move faster across symbols further out in the scan range since the moving beam is being projected from a spinning mirror.

Serial Cmd: <**K500,*scan speed***>

Options: 300 to 1000

Default: **50** (x 10)

Laser On/Off Status

Definition: When enabled, the laser is ON only during the read cycle. When disabled, the laser operates continuously.

Usage: **Laser On/Off** extends the life of the laser. It is useful where there are significant time gaps between symbols. It also provides visual confirmation of a read cycle duration and minimizes laser exposure to people.

Serial Cmd: <**K700,*laser on/off status***,*laser framing status,laser on position,laser off position,laser power*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Laser Framing

Usage: Useful in avoiding highly reflective objects, for filtering out unwanted signals, or avoiding the wrong symbols.

Definition: Sets the percentage of the scan arc that the laser is ON for each scan.

Laser Framing Status

Definition: When **Laser Framing** is disabled, the laser is ON for 100 percent of the full scan. When enabled, the extent of the laser arc is determined by the **Laser On Position** and **Laser Off Position** settings.

Serial Cmd: <**K700,***laser on/off status,****laser framing status****,laser on position,laser off position,laser power*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Note: Because scan widths are not always perfectly symmetrical, the most effective way to setup laser framing is to experiment with the **Laser On Position** and **Laser Off Position** commands until you get the best results.

Laser On Position

Definition: Percentage of the full scan arc that the scan beam moves through before the laser turns ON. For example, if set for 30, the laser will be off during the first 30 percent of the scan.

When **Laser Framing** is disabled, the laser is ON for 100 percent of the full scan. When **Laser Framing Status** is enabled, the laser remains OFF from the start of the scan and remains OFF for the specified percentage of the scan, which is up to 70 percent of the scan, as specified by this command.

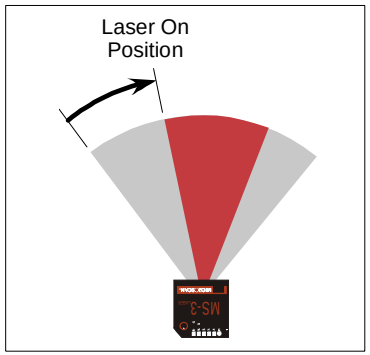


Figure 7-1 Laser On Position

Serial Cmd: <**K700,***laser on/off status,laser framing status,**laser on position**,laser off position,laser power*>

Default: **10**

Options: 1 to 70

Laser Off Position

Definition: Percentage of the full scan arc that the scan beam moves through before the laser turns OFF.

Notes:

The combined values of **Laser On Position** and **Laser Off Position** cannot exceed 100 percent, the total arc of one scan.

Laser Off Position must always exceed the value of **Laser On Position** for an actual laser scan to take place.

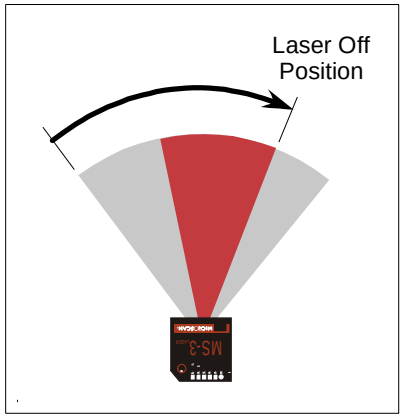


Figure 7-2 Laser Off Position

Serial Cmd: <**K700,***laser on/off status,laser framing status,laser on position,**laser off position**,laser power>*

Default: **90**

Options: 20 to 100

Laser Power

Definition: Allows the user or calibration routine to select laser power setting.

Serial Cmd: <**K700,***laser on/off status,laser framing status,laser on position,laser off position,****laser power***>*

Default: **Medium**

Options: 0 = Low
1 = Medium
2 = High

Automatic Gain Control

AGC is the acronym for Automatic Gain Control. AGC increases the depth of field by attempting to maintain signal strength at a constant level regardless of the range of the bar code label.

Gain Adjustment

(factory setting)

Definition: Sets a voltage amplitude value for the analog circuitry.

Usage: Can be useful for fine-tuning gain or when portions of analog signals spike, as in the case of specular reflection or extraneous noise.

Caution: Changes to **Gain** are best done by the Calibration routine.

Serial Cmd: <**K504,*gain adjustment***,*AGC sampling,AGC min,AGC max*>

Default: 90 (nominal)**.**

Note: **Gain** is optimized at the factory before shipment; the default value may not be 90.

Options: 40 to 255

AGC Sampling

Definition: **AGC Sampling** allows you to specify how automatic gain control sampling will be done.

Serial Cmd: <**K504,***gain adjustment*,***AGC sampling***,*AGC min,AGC max*>

Default: **Continuous**

Options: 0 = Disabled
1 = Leading Edge
2 = Continuous

Disabled

Definition: When **AGC Sampling** is set to **Disabled**, gain levels can only be manually controlled by the **Gain** command ("Gain Adjustment" on page 6-6).

Usage: **Disabled** is not recommended, but can be useful in certain applications in which labels do not require a large depth of field.

Leading Edge

Definition: Finds the leading edge of a symbol by looking for a 40µS quiet zone followed by the number of transitions set in "Transition Counter Threshold" on page 6-8, stores the highest value of the samples, and adjusts the AGC accordingly at the end of the scan.

Usage: **Leading Edge** is rarely used, but in some cases can improve scan rates when labels are skewed and the leading edge of a label is difficult to locate.

Continuous

Definition: Samples AGC throughout the scan at the rate set in "Transition Counter Threshold" on page 6-8, averages the sample values, and adjusts the AGC value at the end of the scan.

Usage: **Continuous** is the default and the preferred mode for sampling analog signal amplitude.

AGC Minimum

(Read Only)

Definition: Limits the hardware gain available to the software for the usable range.

Serial Cmd: <**K504,***gain adjustment,AGC sampling,**AGC min**,AGC max*>

Send **<K504?>** for a readout.

AGC Maximum

(Read Only)

Definition: Limits the hardware gain available to the software for the usable range.

Serial Cmd: <**K504,***gain adjustment,AGC sampling,AGC min,**AGC max***>

Send **<K504?>** for a readout.

Transition Counter

Used for both AGC and symbol detection routines (see “No Symbol Message” on page 8-10 and “Minimum Bar Transitions” on page 7-13.

Definition: During the read cycle, the scanner counts the number of bar and space transitions that have been defined in the **Transition Counter Threshold**. If the count matches or exceeds the threshold, the scanner will perform AGC routines.

Transition Counter Status

Note: This command is currently unavailable in ESP. To determine the current status, send a **<K505?>** command.

Serial Cmd: <**K505,*transition counter status***,*transition counter threshold*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Transition Counter Threshold

Definition: Determines the number of bar/space transitions that must be read before a symbol is considered present and AGC can be resolved.

Usage: Can be useful in certain application where extraneous objects in the field of view might require a higher threshold.

Serial Cmd: <**K505,***transition counter status*,***transition counter threshold***>

Default: **14**

Options: 0 to 255

Bar Detection

Minimum Bar Transitions

Definition: Allows the user to define the minimum number of bar transitions at which a symbol will be detected.

Serial Cmd: <**K502,***(not used)*,***minimum bar transitions***,*maximum element*>

Default: **38** (bars)

Options: 5 to 255

Maximum Element

Definition: Maximum Element represents the maximum bar element width, as measured in micro seconds, that's allowed before a video reset occurs (default to white).

Usage: **Caution**: Do not change this parameter unless instructed by a Microscan representative.

Serial Cmd: <**K502,***(not used)*,*minimum symbol transitions*,***maximum element***>

Default: **1500** (45.75µS)

Options: 1 to 65535 (.035µS to 2294µS increments)

Chapter

8

Data Outputs

Chapter Contents

Symbol Output 8-4
Message Output 8-7
Serial Verification 8-11
Quality Output 8-13
Partial Outputx 8-14

This section includes instructions for setting up conditions for data outputs.

Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>** To see all “K” commands, send **<K?>**.

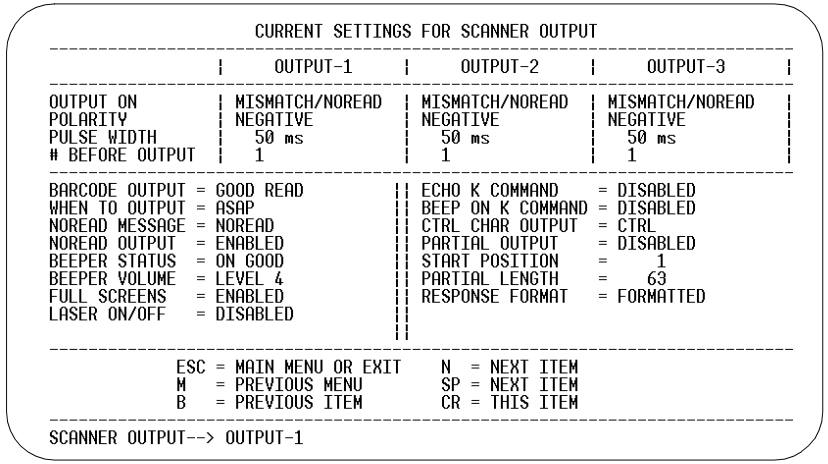
Output Conditions by Serial Command

Command Title	Format
Symbol Output	<**K705,***symbol output status,when to output*>
Noread Message	<**K714,***status,noread message*>
Bad Symbol Message	<**K715,***bad symbol status,bad symbol message*>
No Symbol Message	<**K716,***no symbol status,no symbol message*>
Serial Verification	<**K701,***serial command echo status,serial command beep status,control/hex output*>
Quality Output	<**K704,***quality output separator,reads/trigger status*>
Partial Output	<**K703,***partial output status,start postion,length*>
Beeper Output	<**K702,***beeper output*>

Output Conditions by Embedded Menus

For information on accessing the embedded menus, see “Embedded Menus” on page A-22.

From the **Main** menu, scroll down through the options and select the following screen:


CURRENT SETTINGS FOR SCANNER OUTPUT
OUTPUT-1
OUTPUT-2
OUTPUT-3
OUTPUT ON | MISMATCH/NOREAD | MISMATCH/NOREAD | MISMATCH/NOREAD
POLARITY | NEGATIVE | NEGATIVE | NEGATIVE
PULSE WIDTH | 50 ms | 50 ms | 50 ms
BEFORE OUTPUT | 1 | 1 | 1
BARCODE OUTPUT = GOOD READ
WHEN TO OUTPUT = ASAP
NOREAD MESSAGE = NOREAD
NOREAD OUTPUT = ENABLED
BEEPER STATUS = ON GOOD
BEEPER VOLUME = LEVEL 4
FULL SCREENS = ENABLED
LASER ON/OFF = DISABLED
ECHO K COMMAND = DISABLED
BEEP ON K COMMAND = DISABLED
CTRL CHAR OUTPUT = CTRL
PARTIAL OUTPUT = DISABLED
START POSITION = 1
PARTIAL LENGTH = 63
RESPONSE FORMAT = FORMATTED
ESC = MAIN MENU OR EXIT
M = PREVIOUS MENU
B = PREVIOUS ITEM
N = NEXT ITEM
SP = NEXT ITEM
CR = THIS ITEM
SCANNER OUTPUT--> OUTPUT-1

Symbol Output

Note: **Symbol Output** relates to data and should not to be confused with **Discrete Outputs** listed in the Chapter 8, "Data Outputs" which describe output states and functions.

Symbol Output Status

Definition: Defines the conditions under which decoded symbols are transmitted to the host.

Usage: Useful when the host needs bar code data only under certain conditions.

Serial Cmd: <**K705,*symbol output status***,*when to output*>

Default: **Good Read**

Options: 0 = Disabled
1 = Match
2 = Mismatch
3 = Good Read

Note: If set to **Match** or **Mismatch**, **Symbol Output Status** will not take effect unless **Matchcode Type** is enabled and a master symbol is loaded into memory.

Disabled

Definition: When set to **Disabled**, the scanner will not transmit any data that is generated during a read cycle (symbols, noreads, etc.).

Usage: It is useful when an application only needs to use the discrete outputs and can allow the scanner to do the decision-making. When **Disabled**, the host does not need the symbol data and the communication lines are used only for setup and status checks.

Match

Definition: When set to **Match**, the scanner transmits symbol data whenever a symbol matches a master symbol. However, if **Matchcode Type** is **Disabled**, it transmits on any good read.

Note: A noread can still be transmitted if **Enabled**.

Usage: **Match** is used in an application that requires specific symbol information and needs to sort, route or verify based on matching the specific symbol data.

Mismatch

Definition: With **Mismatch** enabled, the scanner transmits symbol data whenever the symbol data information does NOT match the master symbol.

Note: A noread can still be transmitted if enabled.

Usage: **Mismatch** is typically used as a flag within the host system to prevent an item from being routed in the wrong container.

Good Read

Definition: With **Good Read** enabled, the scanner transmits symbol data on any good read regardless of **Matchcode Type** setting.

Note: A noread can still be transmitted if enabled.

Usage: **Good Read** is used when an application requires all symbol data to be transmitted. It's typically used in tracking applications in which each object is uniquely identified.

When to Output Symbol Data

Definition: This command allows the user to choose when symbol data can be sent to the host.

Serial Cmd: <**K705,***symbol output status,****when to output***>

Default: **As Soon As Possible**

Options: 0 = As Soon As Possible 1 = End of Read Cycle

As Soon As Possible

Definition: Enabling **As Soon As Possible** causes symbol data to be sent to the host immediately after a symbol has been successfully decoded.

Note: More than one decode might in fact be required to qualify as a good decode, depending on how **Decodes Before Output** is set.

Usage: **As Soon As Possible** is useful in applications in which symbol data needs to be moved quickly to the host, typically when the host is making decisions based on symbol data.

End of Read Cycle

Note: See "End of Read Cycle Mode" on page 4-15 for options to end the read cycle.

Definition: Enabling **End of Read Cycle** means that symbol data does not get sent to the host until the read cycle ends with a timeout or new trigger.

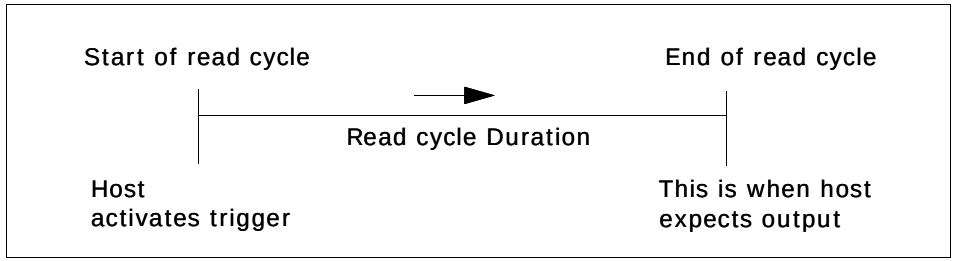


Figure 8-1 Read Cycle

Usage: **End of Read Cycle** is useful in timing-based systems in which the host is not ready to accept data at the time it is decoded.

Message Output

The following flow chart explains the logic paths taken for **Noread**, **Bad Bar Code** and **No Bar Code** outputs.

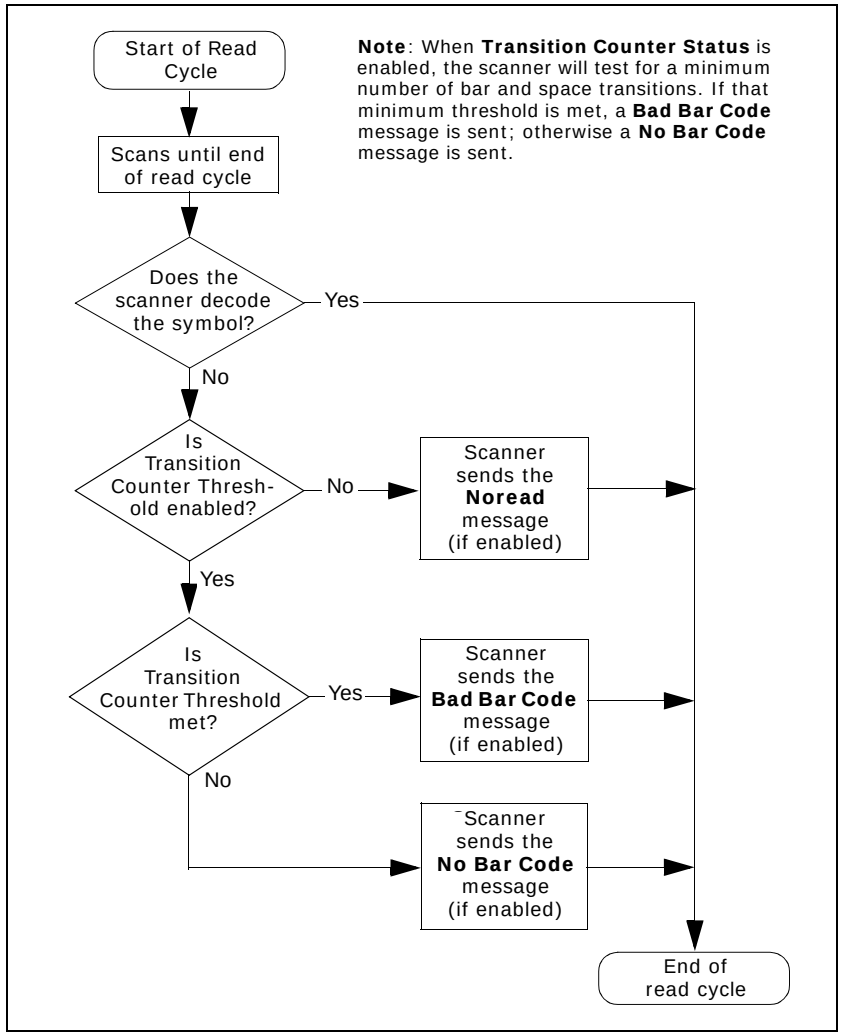

Start of Read Cycle
Scans until end of read cycle
Does the scanner decode the symbol?
Yes
No
Is Transition Counter Thresh-old enabled?
No
Scanner sends the **Noread** message (if enabled)
Yes
Is Transition Counter Threshold met?
Yes
Scanner sends the **Bad Bar Code** message (if enabled)
No
Scanner sends the **No Bar Code** message (if enabled)
End of read cycle
Note: When **Transition Counter Status** is enabled, the scanner will test for a minimum number of bar and space transitions. If that minimum threshold is met, a **Bad Bar Code** message is sent; otherwise a **No Bar Code** message is sent.

Figure 8-2 Output Message Flow

Noread Message

Noread Status

Definition: When enabled, and if no symbol has been decoded before timeout or the end of the read cycle, the noread message will be transmitted to the host.

Usage: Used in applications where the host needs serial verification that a symbol has not been read and especially useful in new print verification.

Serial Cmd: <**K714,*status***,*noread message*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Noread Message

Definition: Any combination of ASCII characters can be defined as the noread message.

Serial Cmd: <**K714,***status*,***message***>

Default: **NOREAD**

Options: 0 to 7 ASCII characters.

Note: Noread Message will only be transmitted if **Symbol Output** ("Symbol Output Status" on page 8-4) is set to **Match**, **Mismatch** or **Good Read**.

Noread Message can be set to any ASCII characters except **NULL <>** and **,** (comma).

Bad Symbol Message

Definition: When enabled, a message is sent to the host when a symbol is detected but not decoded. See "Transition Counter Threshold" on page 6-8.

The **Bad Bar Code** output is tied to the transition counter. If during a read cycle no symbol is decoded and the required setting for the **Transition Sample Threshold** is met, a user defined message will be sent to the host. See "Output Message Flow" on page 9-8.

Usage: Useful in verifying the presence of a bar code symbol that has not been decoded.

Bad Symbol Status

Serial Cmd: <**K715,*bad symbol status***,*bad symbol message*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Bad Symbol Message

Serial Cmd: <**K715,***bad symbol status*,***bad symbol message***>

Default: **BADCODE**

Options: Up to seven ASCII characters (except NUL)

The **Bad Bar Code** output is tied to the transition counter. If during a read cycle no symbol is decoded and the required setting for the **Transition Sample Threshold** is met, a user defined message will be sent to the host.

No Symbol Message

Definition: When enabled, sends a message to the host whenever an object is detected but no bar code symbol is detected.

The **No Symbol** output is tied to the transition counter. If during a read cycle no symbol is decoded and the required setting for the **Transition Sample Threshold** is NOT met, a user defined message will be sent to the host. See "Minimum Bar Transitions" on page 6-13.

Usage: Useful in determining if an object has an attached bar code symbol.

No Symbol Status

Serial Cmd: <**K716,*no symbol status***,*no symbol message*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

No Symbol Message

Serial Cmd: <**K716,***no symbol status*,***no symbol message***>

Default: **NOLABEL**

Options: Up to seven ASCII characters (except NUL)

Serial Verification

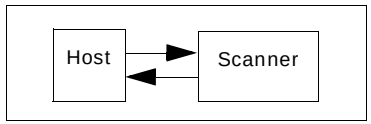
Definition: Allows the user to verify configuration command status.

Usage: These commands are useful in removing any doubt about the scanner's acceptance and response to host configuration commands.

For example, if the current preamble is "SOM" and <Kd1, START> is entered, the scanner will echo back <Kd1, SOM> since the attempted entry "START" exceeds the four character limit for that command. Therefore it is rejected and the existing "SOM" message is echoed back and remains the preamble message.

Serial Command Echo Status

Definition: When enabled, a configuration command received from the host is echoed back to the host with the resultant settings.



Function: If a command with multiple fields is processed, some of the fields may have been processed properly while others were not. The changes will appear in the string echoed back so that the user will know which fields did or did not change.

Serial Cmd: <**K701,*serial command echo status***,*serial command beep status,control/hex output*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Serial Command Beep Status

Definition: Causes the scanner to beep once whenever a K command is entered to indicate that the command was accepted and processed.

Function: If an invalid command is entered, the scanner beeps 5 times to indicate an invalid entry. However, this does not necessarily mean that all data fields have been entered incorrectly. Only one bad field needs to be found in order to activate the 5 beep response.

Usage: Used to audibly verify the acceptance and validity of a command.

Serial Cmd: <**K701,***serial command echo status,***serial command beep status**,*control/hex output*>

Default: **Disabled**

Options: 0 = Disabled 1 = Enabled

Control/Hex Output

Definition: Determines the response to a **Serial Command Echo** or status request command.

When set to **Control**, two characters are transmitted to represent a non-displayable character. For example, a carriage return will be shown as the two characters: **^M**.

When set to **Hex**, the output is the hex character.

Usage: Useful for viewing settings with binary characters when using serial command on a terminal.

Serial Cmd: <**K701,***serial command echo status,serial command beep status,***control/hex output**>

Default: **Control**

Options: 0 = Control 1 = Hex

Operational Command Output

Definition: Directs the scanner to bracket non-bar code scanner data such as counters with command start and stop characters, and echo the command to the host.

Usage: Useful when brackets are required to delineate certain scanner outputs such as counters.

Serial Cmd: <**K701,*status***>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Quality Output

Definition: Allows the host to track the number of good reads per trigger by appending a five digit numeric field to the end of bar code symbol data.

When enabled, bar code data is followed by a separator, followed by the five digits in the form of 00000. For example, a certain bar code that has been averaging 00100 reads per read cycle suddenly drops to 00012, this would be a good indication that a problem has arisen even though good reads are still occurring.

Usage: Host system can monitor scanning performance (printing process, scanning environment changes, etc.) by setting thresholds in their processing or displaying the outputs for visual verification.

Quality Output Separator

Serial Cmd: <**K704,*quality output separator***,*reads/trigger status*>
Default: **,** (comma)
Options: any ASCII character

Note: For all serial configuration commands, the following characters cannot be used:**, < > NUL**

Reads/Trigger Status

Serial Cmd: <**K704,***quality output separator*,***reads/trigger status***>
Default: **Disabled**
Options: 0 = Disabled 1 = Enabled

Partial Output

Status

Definition: When enabled, allows you to pre-select portions of labels to be transmitted by the scanner.

Usage: In **Multilabel** mode, partial output is performed on each separate label. For example, if Start Position is set to 3 and Partial Length is set to 5, the following labels are transmitted as follows:

1234567890 as 34567

1234 as 34

123456789,abcde as “34567,cde” (two labels with separator)

12 as [blank]

Serial Cmd: <**K703,*partial output status***,*start postion,length*>

Default: **Disabled**

Options: 0 = Disabled
1 = Enabled

Start Position

Definition: Allows you to determine the first character from the beginning of a label to transmit.

Serial Cmd: <**K703,***partial output status*,***start postion***,*length*>

Default: **1**

Options: 1 to 63

Partial Length

Definition: Allows you to determine the number of characters to be transmitted.

Serial Cmd: <**K703,***partial output status,start postion*,***length***>

Default: **63**

Options: 1 to 63

Beeper Output

Definition: A beep is emitted either after each good read of a symbol or after each noread.

Note: Beeper will also sound if any of the following occur:

- the scanner is defaulted a send/save command from **ESP** or an **Exit** command from any embedded menu.
- a **<Z>**, **<Zp>**, **<Zd>**, or **<K,1>** command is sent

Usage: Can be used as an audible verification that either a good read or a noread has occurred.

Beeper Output Condition

Serial Cmd: <**K702,*beeper output***>

Default: **On Good**

Options: 0 = Disabled
1 = On Good
2 = On Noread

Chapter

9

Discrete I/O

Chapter Contents

Output 1 9-4
Output 2 9-6
Output 3 9-6

This section includes instructions for setting up conditions for changing input/output electrical transitions for control of internal and external devices. Input and output (in/out) signals are electrical transitions (TTL) from one voltage level to another to allow can occur.

For beeper and laser outputs, see Chapter 7, “Scanner Setup.”

Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>** To see all “K” commands, send **<K?>**.

Output Conditions by Serial Command

Command Title	Format
Output 1	<**K720,***output on,polarity,pulse width,number to output on*>
Output 2	<**K721,***output on,polarity,pulse width,number to output on*>
Output 3	<**K722,***output on,polarity,pulse width,number to output on*>

Output Conditions by Embedded Menus

For information on accessing the embedded menus, see “Embedded Menus” on page A-22.

From the **Main** menu, scroll down through the options and select the following screen:

```
                    CURRENT SETTINGS FOR SCANNER OUTPUT
-------------------------------------------------------------------------------
                  |     OUTPUT-1     |     OUTPUT-2     |     OUTPUT-3     |
-------------------------------------------------------------------------------
OUTPUT ON         | MISMATCH/NOREAD  | MISMATCH/NOREAD  | MISMATCH/NOREAD  |
POLARITY          | NEGATIVE         | NEGATIVE         | NEGATIVE         |
PULSE WIDTH       |   50 ms          |   50 ms          |   50 ms          |
# BEFORE OUTPUT   |   1              |   1              |   1              |
-------------------------------------------------------------------------------
BARCODE OUTPUT = GOOD READ          || ECHO K COMMAND    = DISABLED
WHEN TO OUTPUT = ASAP               || BEEP ON K COMMAND = DISABLED
NOREAD MESSAGE = NOREAD             || CTRL CHAR OUTPUT  = CTRL
NOREAD OUTPUT  = ENABLED            || PARTIAL OUTPUT    = DISABLED
BEEPER STATUS  = ON GOOD            || START POSITION    =     1
BEEPER VOLUME  = LEVEL 4            || PARTIAL LENGTH    =    63
FULL SCREENS   = ENABLED            || RESPONSE FORMAT   = FORMATTED
LASER ON/OFF   = DISABLED           ||
                                    ||
-------------------------------------------------------------------------------
            ESC = MAIN MENU OR EXIT    N  = NEXT ITEM
            M   = PREVIOUS MENU        SP = NEXT ITEM
            B   = PREVIOUS ITEM        CR = THIS ITEM
-------------------------------------------------------------------------------
SCANNER OUTPUT--> OUTPUT-1
```

Output 1

Definition: Sets the discrete output functions for specific user-selected conditions.

Usage: This option provides switching to host software to control external devices such as PLCs and relays. It is useful for routing and sorting and to prevent mis-packaging and mis-routing.

Output On

Definition: Allows the user to set the conditions under which an output (or outputs) will be activated.

Serial Cmd: <**K720,*output on***,*polarity,pulse width,number to output on*>

Default: **Mismatch or Noread**

Options:
0 = Mismatch or Noread
1 = Match
2 = Mismatch
3 = Noread

Note: If **Output On** is set to **Mismatch or Noread**, **Match**, or **Mismatch**, a transition (switching) will not occur unless **Matchcode Type** is enabled and a master symbol is loaded into memory.

Mismatch or Noread

Definition: Activates discrete output when the symbol data does not match that of the master symbol or the symbol has not been decoded before the end of the read cycle.

Match

Definition: Activates a discrete output when the symbol data matches the master symbol.

Note: If you want to output for a good read and **Matchcode** is not enabled, you can enable any output for **Match**.

Mismatch

Definition: Activates a discrete output whenever the symbol data does not match that of the master symbol.

Noread

Definition: Activates a discrete output whenever the symbol data is not decoded before the end of the read cycle.

Output Polarity

Definition: Sets the polarity of the discrete output.

When set to **Active Low** polarity, and an output condition from the scanner is met, the output-1 pin on the scanner's 15 pin connector go low for the time specified in **Pulse Width**. (See Table A-2, "MS-3 Laser Host Connector, 15-pin," on page A-4.)

Serial Cmd: <**K720,***output on,***polarity***,pulse width,number to output on*>

Default: **Active Low**

Options: 0 = Active High 1 = Active Low

Pulse Width

Definition: Sets the time in 1mS increments that the discrete output remains active.

Serial Cmd: <**K720,***output on,polarity,***pulse width***,number to output on*>

Default: **50** (50mS)

Options: 0 to 65535 (0 to 65.535 seconds). Divide the number entered on the command line by 1000 for time in seconds.

Number to Output On

Definition: Sets the number of events (matches, mismatches, noreads, etc. as configured by **Output On**) that must occur before activating the associated output.

Usage: For example, if **Number to Output On** is set to 3 and **Output 1** is set to **Noread**, then **Output 1** will not be activated until 3 noreads have occurred.

Serial Cmd: <**K720,***output on,polarity,pulse width,***number to output on***>

Default: **1**

Options: 0 to 255

Output 2

Serial Cmd: <**K721,***output on,polarity,pulse width,number to output on*>

Output 2 has the same parameters and default settings as **Output 1**.

Output 3

Serial Cmd: <**K722,***output on,polarity,pulse width,number to output on*>

Output 3 has the same parameters and default settings as **Output 1**.

Chapter

10

Diagnostics

Chapter Contents

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Laser High Warning..... 10-6
Laser Low Warning 10-7
NOVRAM Corrupt Warning Status 10-8
Power-on Count 10-9
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This section describes warning and operating messages and their settings.

Important: Since **Warning Messages** and **NOVRAM Messages** are not enabled by default, these messages will not be displayed. However, if you suspect that erroneous defaults are occurring, enable **Warning Messages** and **NOVRAM Messages** by sending **<K”400,1,,,1>**.

Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Note: You can learn the current setting of any parameter by inserting a question mark after the number, as in **<K100?>** To see all “K” commands, send **<K?>**.

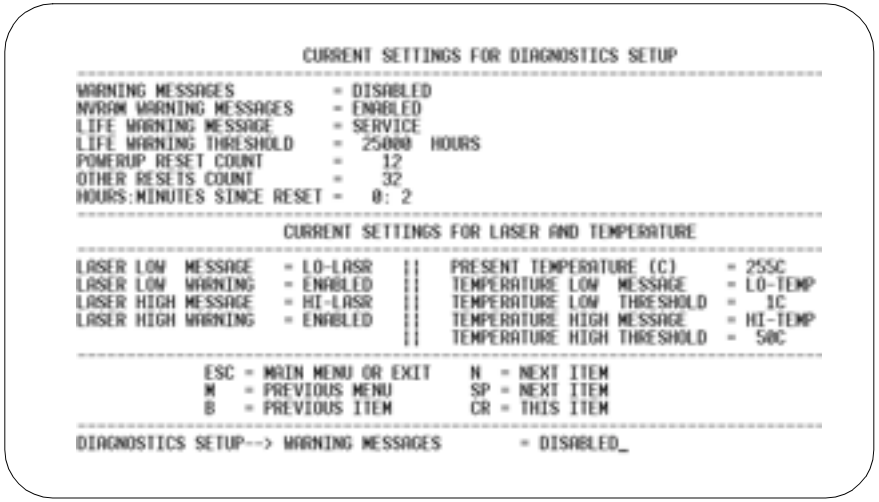
Diagnostics by Serial Command

Command Title	Format
Warning Message Status	<**K400,***warning message status,laser high status,laser low status,novram/reset warning status*>
Laser Overcurrent	<**K404,***message*>
Laser Undercurrent	<**K405,***message*>
Power-on/Resets Counts	**<K406,***power-on count,resets*>
Time Since Last Reset	<**K407?**> *returns: hours,minutes (read only)*

Diagnostics by Embedded Menu

For information on accessing the embedded menus, see “Embedded Menus” on page A-22.

From the **Main** menu, scroll down through the options and select the following screen:


CURRENT SETTINGS FOR DIAGNOSTICS SETUP
WARNING MESSAGES = DISABLED
NVRAM WARNING MESSAGES = ENABLED
LIFE WARNING MESSAGE = SERVICE
LIFE WARNING THRESHOLD = 25000 HOURS
POWERUP RESET COUNT = 12
OTHER RESETS COUNT = 32
HOURS:MINUTES SINCE RESET = 0: 2
CURRENT SETTINGS FOR LASER AND TEMPERATURE
LASER LOW MESSAGE = LO-LASR
LASER LOW WARNING = ENABLED
LASER HIGH MESSAGE = HI-LASR
LASER HIGH WARNING = ENABLED
PRESENT TEMPERATURE (C) = 25SC
TEMPERATURE LOW MESSAGE = LO-TEMP
TEMPERATURE LOW THRESHOLD = 1C
TEMPERATURE HIGH MESSAGE = HI-TEMP
TEMPERATURE HIGH THRESHOLD = 50C
ESC = MAIN MENU OR EXIT
M = PREVIOUS MENU
B = PREVIOUS ITEM
N = NEXT ITEM
SP = NEXT ITEM
CR = THIS ITEM
DIAGNOSTICS SETUP--> WARNING MESSAGES = DISABLED_

Warning Messages Overview

Important Note: **Warning Message Status** must be enabled before any warnings in this menu can be displayed.

Definition: Warning messages that relate to the environment and condition of the scanner can be defined and set to activate specific outputs.

Note: When enabled, the error condition will override all other operational modes configured for the output.

When enabled, laser current and NOVRAM warning messages will be transmitted to the host or any active port whenever the pre-defined conditions are met.

Usage: These messages serve as a flag to service a scanner or as an early warning that potential problems could arise. They are particularly useful in factories that run 24/7 and can't afford down time.

Warning Message Status

Important Note: **Warning Message Status** must be enabled before any warnings in this menu can be displayed.

Function: When enabled, warning messages will be transmitted to the host or any active port.

Note: This option must be enabled before any other warning messages can be transmitted.

Usage: Alerts the user to impending failures or conditions that may soon cause failures.

Serial Cmd: <**K400,*warning message status***,*laser high status,laser low status, novram/reset warning status*>

Default: **Disabled**

Options: 0 = Disabled
1 = Enabled

Laser High Warning

When enabled, a message is transmitted whenever the laser current exceeds a factory-calibrated reference value which cannot be altered. The message repeats once every 30 minutes until the condition is corrected.

Laser High Status

Definition: Enables the **Laser High** message.

Usage: Alerts the user to impending laser failure. (Contact Microscan Service.)

Serial Cmd: <**K400,***warning message status,**laser high status**,laser low status, novram/reset warning status*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Laser High Message

Definition: Defines the **Laser High** message.

Serial Cmd: <**K404,***laser high message*>

Default: **HI-LASR**

Options: Any 1 to 10 character ASCII string except **NUL**, **<**, or **>**.

Laser Low Warning

When enabled, a message is transmitted whenever the laser current falls below a factory-calibrated reference value which cannot be altered. The message repeats once every 30 minutes until the condition is corrected.

Laser Low Status

Definition: Enables the **Laser Low** message.

Usage: Alerts the user to impending laser failure. (Contact Microscan Service.)

Serial Cmd: <**K400,***warning message status,laser high status,**laser low status**, novram/reset warning status*>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Laser Low Message

Definition: Defines the **Laser Low** message.

Serial Cmd: <**K405,***laser low message*>

Default: **LO-LASR**

Options: Any 1 to 10 character ASCII string except **NUL**, **<**, or **>**.

NOVRAM Corrupt Warning Status

When enabled, a 7 character message is sent whenever the system detects a warning condition.

Important Note: **Warning Corrupt Message Status** must be enabled before the **NOVRAM** message in this menu can be transmitted.

Usage: Alerts the user to NOVRAM failure. (Contact Microscan Service.)

Serial Cmd: <**K400,***warning message status*,*laser high status*,*laser low status*, ***novram reset warning status***>

Default: **Enabled**

Options: 0 = Disabled 1 = Enabled

Note: If you suspect that erroneous defaults are occurring, enable **NOVRAM Messages** by sending **<K400,1,,,1>**. This will allow the **NOVRAM** messages, if present, to be viewed.

Warning messages for NOVRAM can appear in one of five formats:

<NVRAM-C>

This message indicates an error in user settings. The message repeats once every 30 minutes. If this message is received, restore customer defaults with **<Zrc>**.

If the condition persists, contact Microscan Service.

<NVBAD-D>

Indicates that diagnostic lifetime hours, power-on counts, and reset counts have been lost. The message repeats once every 30 minutes. (Contact Microscan Service.)

<NVBAD-L>

Indicates a problem with laser current factory reference. The message repeats once every 30 minutes. (Contact Microscan Service.)

<DFALT-C>

Indicates that the customer NOVRAM settings have been defaulted either by a customer initiated default or by a problem with the scanner. This message is sent ONLY ONCE.

<DFALT-F>

Indicates that the factory NOVRAM settings have been defaulted. This message is sent ONLY ONCE upon reset. (Contact Microscan Service.)

Power-on Count

(These commands are READ ONLY.)

Count

Definition Returns the number of times the scanner has been re-powered or a watchdog reset occurs.

Usage: Useful for detecting unwanted resets caused by power supply problems or ESD transients.

Serial Cmd: Send <**K406?**>

Returns <**K406** ***power-on count***,*resets*>

Read Only Ranges: 0 to 65,535 powerups, 0 to 65,535 resets.

Resets

Definition Resets include watchdog reset, <A>, <Z>, <Zd>, and hardware defaults. A watchdog reset is a reset that is forced whenever the software locks-up.

Usage: Useful for detecting unwanted resets caused by power supply problems or ESD transients.

Serial Cmd: Send <**K406?**>

Returns <**K406** *power-on count*,***resets***>

Read Only Ranges: 0 to 65,535 powerups, 0 to 65,535 resets.

Time Since Last Reset

(This command is READ ONLY.)

Definition:	Records the number of hours and minutes of operation since the last system reset.
Usage:	Useful as a troubleshooting tool that can help pinpoint the cause of a reset.
Serial Cmd:	Send <**K407?**> Returns <**K407*hours,minutes***>
Read Only Ranges:	0 to 23 hours, 0 to 59 minutes.

Chapter

11

Utilities

Chapter Contents

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Utility commands are generally commands that are performed during scanner operations to check read rates, determine read rates or perform miscellaneous operations on scanner hardware. Serial utility commands are not prefaced with a “K” and a numeric code, nor do they require an initialization command (<A> and <Z>). They can be entered from within any terminal program.

Note: The characters **NULL <>** and **,** can only be entered through embedded menus, not through ESP or serial commands.

Note: Utility commands are not accessible by embedded menus.

Utilities by Serial Command

Table 11-1 Summary of Utility Serial Commands

Command Type	Command	Name
Counter Request and Clear	<N>	Noread Counter
	<O>	Noread Counter Reset
	<T>	Trigger Counter
	<U>	Trigger Counter Reset
	<V>	Good Read/Match Counter
	<W>	Good Read/Match Counter Reset
	<X>	Mismatch Counter
	<Y>	Mismatch Counter Reset
Part Number/ Checksum	<!>	Display Checksums of EPROM Flash memory
	<!b>	Display Checksum for Boot Code
	<!a>	Display Checksum for Application Code
	<#>	Display Part Numbers
	<#b>	Display Boot Code Part Number
	<#a>	Display Application Code Part Number
Read Rate	<Cp>	Enter Single Symbol Percent Rate Test
	<C>	Enter Single Symbol Decode Rate Test
	<Cm>	Enter Multisymbol Percentage Rate Test
	<Cs>	Enter Multisymbol Decode Rate Test
	<J>	Exit Decode Rate and Percent Rate Test
Device Control	<H>	Enable Laser Scanning
	<I>	Disable Laser Scanning
	<KE>	Motor On
	<KF>	Motor Off
	<L1>	Programmable Output 1
	<L2>	Programmable Output 2
	<L3>	Programmable Output 3
Code Types	<P>	Autodiscriminate All Codes
	<Q>	Enable Code 39 Only
	<R>	Enable Codabar Only
	<S>	Enable I 2/5 Only
Trigger	<char>	Serial Trigger Character
Default/Reset/Save	<A>	Reset (does not save for power-on)
	<Ard>	Reset and recall factory defaults
	<Arp>	Reset and recall power-on parameters
	<Arc>	Recall and recall customer default parameters
	<Z>	Save current settings for power-on
	<Zc>	Save current settings as customer default parameters

Table 11-1 Summary of Utility Serial Commands

Matchcode	**<E>**	Enable **Matchcode** (see also <**K223,**...> on page 6-2.)
	<F>	Disable **Matchcode** (see also <**K223,**...> on page 6-2.)
	<K224,*number of master symbols***>**	Set master symbol database size. Also <**KM***number of master symbols*>
	<)*data***)>**	Enter symbol data as master symbol #1.
	<**K231,***master symbol number***,***data***>**	Enter symbol data to specified master symbol. Also <**M***master symbol number***,***data*>
	<G>	Store next symbol scanned as master symbol #1.
	<**G***master symbol number***>**	Store next symbol scanned as specified master symbol.
	<)>	Request master symbol #1.
	<**K231,?>**	Request all master symbol information. Also **<M?>**
	<**K231,***master symbol number***?**>	Request specified master symbol information. Also **<M#?>**
	<**K231,***master symbol number***,>**	Delete specified master symbol. Also <**M***master symbol number***,**>
	<))>	Delete Master Symbol # 1
	<K225,*status***>**	Enable/disable New master pin
Network Status	**<n>**	Network status Command
Status Requests	**<?>**	Scanner Status
	<?1>	Extended scanner status
	<K?>	Configuration status

Counters

Counter commands can be a numeric value from 00000 to 65,535. After reaching the maximum numeric limit of 65,535, the counter will automatically roll-over and start counting again at 00000. To obtain the cumulative total of counts after the roll-over has occurred, add 65,536 per each roll-over (the scanner does not keep track of the number of roll-overs) to the current count.

Note: All counter values will be lost if power is recycled to the scanner or the scanner receives a reset or save command.

By Serial Command

Noread Counter

Sending **<N>** displays the total number of noreads that have occurred since the last reset.

Noread Counter Reset

Sending **<O>** sets Noread Counter to 00000.

Trigger Counter

Sending **<T>** displays the total number of triggers since the last reset.

Trigger Counter Reset

Sending **<U>** sets the trigger counter to 00000.

Good Read/Match Counter

Sending **<V>** displays the total number of good reads matching the master symbol if **Matchcode** is enabled. This counter is always enabled, but will only work as a match count when **Matchcode** is enabled. If **Matchcode** is not enabled, this counter records the number of good reads. This count can be requested at any time.

Good Read/Match Counter Reset

Sending **<W>** sets the match counter to 00000.

Mismatch Counter

With **Matchcode** enabled, sending **<X>** displays the number of decoded symbols since the last reset that do not match the master symbol.

Mismatch Counter Reset

Sending **<Y>** sets the mismatch counter to zero.

Part Number

You can send a request to the scanner for associated part numbers.

By Serial Command

Upon sending **<#>** the scanner returns software part numbers for application code <#a/__________> and boot code <#b/_________>.

Individual part numbers for **Application Code** and **Boot Code** are returned when their respective commands **<#a>** and **<#b>** are sent.

Checksum

A Checksum verifies a scanner's flash memory.

By Serial Command

Upon sending **<!>** the scanner returns two 4-digit hex numbers that are the check sums for boot code and the application code.

Individual checksums for **Boot Code** and **Application Code** and **Raster Code** are returned when their respective commands **<!b>** and **<!a>** are sent.

Read Rate

When in a read rate mode, the scanner will output a number preceding the symbol data. This number will represent either the number of decoded scans per second or the percentage of successful decoder per total number of scans.

Make a note of the decode rate. It will be a useful reference when calculating the number of decodes (see "Formulas for Number of Decodes" on page A-46).

Read Rate By Serial Command

Enter Single Symbol Decodes/Second Test

Sending **<C>** instructs the scanner to transmit the decodes per second and symbol data (if any). The decode rate can vary dramatically due to the angle and location of the symbol in relation to the scan line. This test is very useful in aligning and positioning the scanning device during installation.

Enter Single Symbol Percent Test

Sending **<Cp>** instructs the scanner to transmit the percentage of decodes and any scanned symbol data.

Enter Multisymbol Decode Rate Test

Sending **<Cs>** instructs the scanner to transmit the decode rate and symbol data (if any) for multiple symbols.

Enter Multisymbol Percent Test

Sending **<Cm>** instructs the scanner to transmit the percentage of scans decoded and symbol data (if any) for multiple symbols.

End Read Rate Test

Sending **<J>** ends both the **Percent** test and the **Decodes/Second** test for both single and multi-symbol.

Device Control

By Serial Command

Enable Laser Scanning

Sending **<H>** caused the laser to be on continuously.

Note: Enable Laser Scanning does not relate to **Laser On/Off** command.

Disable Laser Scanning

Sending **<I>** will turn the laser off and end the current read cycle. This feature is useful during extended periods of time when no bar code symbols are being scanned or the scanner is being configured. Disabling laser scanning will not affect any downloaded commands to the scanner.

Note: Disable Laser Scanning does not relate to **Laser On/Off**, which when enabled also turns off the laser but only between read cycles.

Motor On

Sending **<KE>** turns the spinning mirror and raster mirror motors on (if not already running).

Note: The spinning mirror reaches full speed after a short time delay.

Motor Off

Sending **<KF>** turns the spinning mirror motor off. This command is useful for long idle periods.

Note: Laser turns off whenever motor is off.

Output 1

Sending **<L1>** pulses activates the link between Output 1(+) and Output 1(–) of the host connector for the duration set by "Pulse Width" on page 8-18. (regardless of Master Symbol or Output 1 status).

Output 2

Sending **<L2>** pulses activates the link between Output 2(+) and Output 2(–) of the host connector for the duration set by "Pulse Width" on page 8-18. (regardless of Master Symbol or Output 2 status).

Output #3

Sending **<L3>** pulses activates the link between Output 3(+) and Output 3(–) of the host connector for the duration set by "Pulse Width" on page 8-18. (regardless of Master Symbol or Output 3 status).

Symbol Type

Sending **<P>** enables the scanner to decode all available symbol types without changing scanner configuration.

Sending **<Q>** enables the scanner to decode Code 39 symbols without changing scanner configuration.

Sending **<R>** enables the scanner to decode Codabar symbols without changing scanner configuration.

Sending **<S>** enables the scanner to decode I 2 of 5 symbols without changing scanner configuration.

Defaulting/Saving/Resetting

Understanding and controlling your reader's active, saved, and default settings is critical to the operation of your reader.

Table 11-2 Software Reset/Save/Recall Commands

<A>	Reset (does not save for power-on)
<Ard>	Reset and recall factory defaults
<Arp>	Reset and recall power-on parameters
<Arc>	Reset and recall customer default parameters
<Z>	Save current settings for power-on
<Zc>	Save current settings as customer default parameters
<Zrd>	Recall factory default parameters and save for power-on
<Zrc>	Recall customer default parameters and save for power-on

Power-on Parameters

Power-on parameters (saved by the <**Z**> command) are saved to NOVRAM and recalled and loaded into current parameters when power is cycled or the <Arp> command is issued.

Customer Default Parameters

Customer default parameters (saved by **<Zc>** command) are the same set of parameters as power-on but are saved in a different, isolated section of NOVRAM. This can allow a user to essentially create a backup set of parameters that can be recalled in the event that the current parameters or power-on parameters have been changed. It is important to note that a hardware default does not affect these parameters. For example, a user may have inadvertently changed communication settings in power-on parameters in such a way that they either may not know the settings or don't have the ability to communicate at those settings. By using the hardware default to default the power-on settings to the known factory defaults, the user can subsequently recall their previously customer saved settings with the <**Arc**> or <**Zrc**> commands.

Factory Default Parameters

Factory defaults parameters are contained in the firmware that cannot be changed.

Software Factory Defaults

Factory default parameters can be recalled (loaded into current settings) with **<Ard>** command or recalled and saved for power-on with the **<Zrd>** command.

Hardware Factory Default

If a software default reset is not possible, it may be necessary to reset the reader by shorting (connecting) specific pins. This procedure has the same effect as the <**Zrd**> software command.

1. Apply power to the reader.
2. If using an IB-150, locate pins 7 and 11 on the host connector (see Table A-6 on page A-5).

   Caution: Be certain that the correct pins are located. Connecting the wrong pins could cause serious damage to the unit.
3. Momentarily connect these wires (or pins) and listen for a series of short beeps.
4. Within 3 seconds, connect them again. A longer beep should be heard. If not, repeat the process.

Default on Power-On

You can also use the EZ button to default the reader by holding down the EZ button while applying power to the reader.

Default/Reset Definitions

Defaults are original or saved settings that can be recalled, either by software or hardware reset.

Defaulting occurs when default settings (customer or factory) are recalled. Defaulting might be necessary if you have make temporary changes, communications between the reader and another device are lost or interrupted, or you are using incompatible equipment (for example, a terminal that is set at 38.4K baud communicating with a reader that is set at 115.2K baud).

Resets ("**A**" commands) affect only the current settings (active memory) and are not saved for power on or recall.

Active Memory is where the reader's active settings are stored during use. These are not available on power-on unless saved by a "**Z**" command.

Code Types Enable Commands

See also “Autodiscriminate” on page 5-26 for a discussion of **Utility** commands for **Code Types** and **Autodiscrimination**.

Default: **Code 39 (only)**

Options:
<P> Enables most code types.
<Q> Enable Code 39 only
<R> Enable Codabar only
<S> Enable I 2/5 only

Master Symbol Database

See Chapter 6, “Matchcode” for master symbol commands.
See “Master Symbol Database” on page 6-11 for master symbol database commands.

Scanner Status Requests

<?> Scanner Status Byte

The scanner responds to a status request **<?>** with a two character hex value, for example **<?/22>**. To determine the status:

1. Look up the binary conversion in Table 11-3.

   For example, the first **2** in binary would be **0 0 1 0** as read from binary digits 3 through 0; the second **2** the binary digits 7 through 4 which is also **0 0 1 0**.

2. Next, enter your binary values in Table 11-4 in the "Binary" column next to the appropriate bit.

Table 11-4 MS-3 Laser Scanner Status

Bit	Binary	Scanner Status
0	***0***	Command error detected
1	***1***	Command received
2	***0***	Communication error detected
3	***0***	Flash sector unprotect failure
4	***0***	Host/Aux port buffer overflow
5	***1***	Scanner is in a read cycle
6	***0***	Software Watch dog reset
7	***0***	Hardware Watch dog reset

3. Under "Binary," interpret ***1***s as true and the ***0***s as not true. For example, bit 1 has a ***1*** in the "Binary" column, indicating "Command Received." Bit 5 is also a ***1*** indicating that the "Scanner is in a read cycle."

Table 11-3 Hex Value to Binary Conversion

Hex Value	Binary Bit Digits			
	7	***6***	***5***	***4***
	3	***2***	***1***	***0***
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
A	1	0	1	0
B	1	0	1	1
C	1	1	0	0
D	1	1	0	1
E	1	1	1	0
F	1	1	1	1

<?1 > Extended Status

The scanner responds to an extended status request **<?1>** with several fields, for example: **<?/F><?1/35-338200-12,35-338201-14,476C,33,33>**.

These represent: the status byte discussed above, the boot part number (**35-338200-12**), the application part number (**35-338201-14**), the fpga part number (**5-559001-18**), flash checksum (**476C**), current RAM parameter checksum (**33**), and flash parameter checksum (**33**).

<K?> Configuration Command Status

Returns the current status of all configuration commands.

Appendices

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Appendix A — General Specifications

Mechanical

Height: 0.85” (21.6mm)

Width: 1.75” (44.5mm)

Depth: 1.75” (44.5mm)

Weight: 2.0 oz. (57g)

Environmental

Enclosure rating: IP54

Operating temperature: 0° to 40°C (32° to 122°F)

Humidity: Up to 90% (non-condensing)

Operating life: 40,000 hours at 25°C

Laser Light

Semiconductor, visible laser diode (650nM nominal); CDRH Class II

Scanning Parameters

Options: Single line, fixed raster

Scan rate: Adjustable from 350 to 1000 scans per second; default = 500

Scan width angle: >70°

Pitch: ±50°

Skew: ±40°

Symbol contrast: 25% min. @ 650nM

Communication

RS232, RS422/485, Keyboard wedge, USB

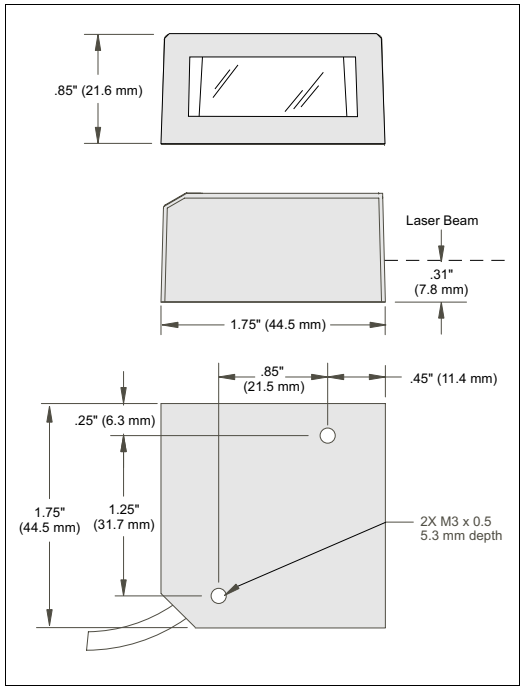


Figure A-1 MS-3 laser Dimensions

Connector

3 ft. (914mm) cable terminated with 15-pin D-Sub socket connector.

Symbol Types

Standard offering: Code 39, Code 93, Code 128, Codabar, Pharmacode, Interleaved 2 of 5, UPC/EAN

Indicators

Beeper: Good read, Match/Mismatch, Noread, On/Off

LEDs: 1 status, 1 power, 5 read performance (representing percentage of good decodes).

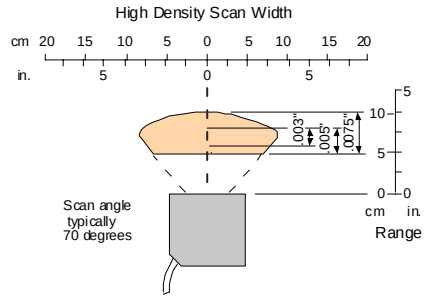
LED	State	Status
Power	Green On	Scanner has power
Ready/80%	Amber On	Scanner is ready to read
GD/RD/100%	Amber On	Symbol is qualified as good

Discrete I/O

Trigger Inputs: 3 to 24V rated (10mA @24VDC)

Read Ranges

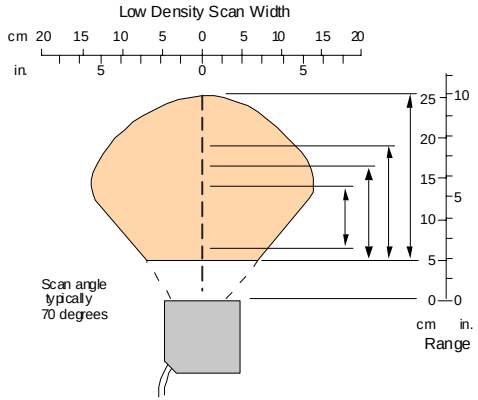
High Density



High Density Ranges

Symbol Density	Inside		Outside	
	mm	inches	mm	inches
.003" (.076mm)	58.4	2.3	68.5	2.7
.005" (.127mm)	50.8	2	78.7	3.1
.0075" (.191mm)	50.8	1.3	102	3.6

Low Density



Low Density Ranges

Symbol Density	Inside		Outside	
	mm	inches	mm	inches
.0075" (.191mm)	63.5	2.5	140	5.5
.010" (.254mm)	50.8	2	165	6.5
.015" (.381mm)	50.8	2	191	7.5
.020" (.508mm)	50.8	2	254	10
.020" (.508mm)	50.8	2	254	10

FIS Table

Table A-1 FIS Numbers

Safety Certifications

FCC, CDRH, CE, UL/cUL, TüV, BSMI

Product specifications are given for typical performance at 25°C (77°F) using grade A symbols. Some performance characteristics may vary at high temperatures or other environmental extremes.

© Microscan Systems, Inc. Specifications subject to change.Electrical Specifications

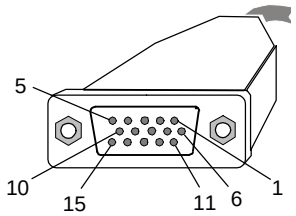
Appendix B — Electrical Specifications

Maximum Operating Power: __ Watts
Power Input: 5V, ___mV p-p max. ripple, ___ mA @ 24VDC (typical)
Trigger Inputs: 3 to 24V rated (10mA @24VDC)
New Master: 3 to 24V rated (10mA @24VDC)
Outputs (1, 2, 3): 5V TTL compatible

Scanner Pin Assignments

Table A-2 MS-3 Laser Host Connector, 15-pin

Pin	Host RS232	Host & Aux RS232	Host RS422/485	In/ Out
1	Power +5VDC			In
2	TxD	TxD	TxD (–)	Out
3	RxD	RxD	RxD (–)	In
4	Power/Signal ground			
5	NC			
6	RTS (5v only)	Aux TxD	TxD (+)	Out
7	Output 1 TTL			Out
8	Default configuration			In
9	Trigger (NPN)			In
10	CTS (5v only)	Aux RxD	RxD (+)	In
11	Output 3 TTL			Out
12	New master pin (NPN)			In
13	Chassis ground			
14	Output 2 TTL			Out
15	NC			Out



Caution:

- Be sure all cables are connected **BEFORE** applying power.
- Always power down **BEFORE** disconnecting any cables.

Appendix C — ADP Interface Box

Table A-3 Host 25-pin Connector

Pin	Function
1	Chassis
2	Transmit data (RS-232)
3	Receive data (RS-232)
7	Signal ground
8	Output 1 (TTL)
9	+5 VDC
10	Trigger (NPN)
11	Default configuration (NPN)

Table A-4 Trigger 6-pin Connector

Pin	Function
1	Trigger
3	+ 5 VDC
4	+ 12 VDC
5	Power ground

Table A-5 Power 5-pin Connector

Pin	Function
1	Signal ground
2	Chassis ground
3	+5 VDC
4	–12 VDC
5	+12 VDC

Table A-6 Scanner 15-pin Connector

Pin	Function
1	+5 VDC
2	Transmit RS-232 (TTL)
3	Receive RS-232 (TTL)
4	Power/Signal ground
8	Default configuration (NPN)
9	Trigger (NPN)
13	Chassis ground

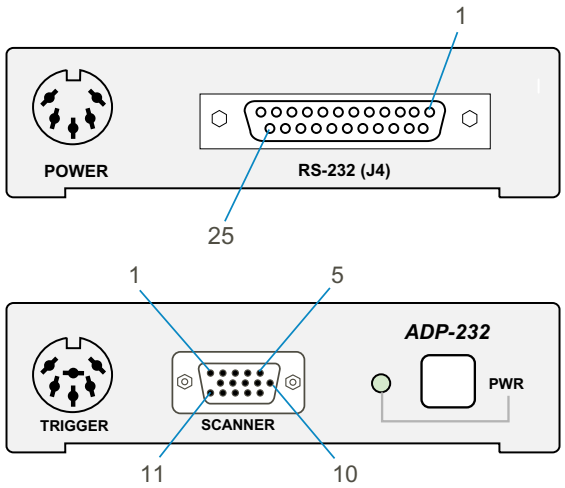


Figure A-2 ADP RS-232 Interface Box

A–Appendices

Appendix D — Serial Configuration Commands

The following table is a list of all the available serial configuration commands (also called “K” commands) in alphabetical order. These commands are also listed at the beginning of each chapter, as applicable. For utility (operational) commands see Table 11-1, “Summary of Utility Serial Commands,” on page 11-2.

Table A-7 Serial Configuration Commands in Numeric Order

Command Title	Format
Host Port Parameters	<**K100,***baud,parity,stop bits,data bits*>
Aux Port Parameters	<**K101,***aux port mode,baud,parity,stop bits,data bits,daisy chain status,daisy chain ID*>
IrDA Port and Text	<**K103,***IR status,IR timeout,menu mode*>
Host Protocol	<**K140,***protocol*>
Preamble	<**K141,***status,preamble*>
Postamble	<**K142,***status,postamble*>
Response Timeout	<**K143,***timeout*>
Intercharacter Delay	<**K144,***time interval*>
LRC	<**K145,***status*>
Aux/Config. Port Data	<**K146,***aux status,config status*>
Daisy Chain Scanner ID	<**K151,***daisy chain scanner,daisy chain scanner ID*>
Trigger Mode	<**K200,***trigger mode,trigger filter duration*>
Serial Trigger Character	<**K201,***serial trigger character*>
External Trigger State	<**K202,***external trigger state*>
End of Read Cycle	<**K220,***end of read cycle status,timeout*>
Good Decode Reads	<**K221,***decodes before output,consecutive status*>
Multisymbol	<**K222,***number of symbols,multisymbol separator*>
Matchcode Type	<**K223,***type,sequential matching,match start position,match length,wild card character,sequence on noread,sequence on every mismatch*>
Master Symbol Database Size	<**K224,***number of master symbols*>
New Master Pin	<**K225,***status*>
Sequential Step	<**K228,***sequence step*>
Start Serial Trigger Character	<**K229,***start trigger character*>
End Serial Trigger Character	<**K230,***end trigger character*>
Enter/Delete Master Symbol Data	<**K231,***master symbol number,master symbol data [no data will delete current master symbol data]*>
Request Master Symbol Data	<**K231,?**>*[for all]* or <**K231,***master symbol number***?**>
Warning Message Status	<**K400,***warning message status,laser high status,laser low status,novram/reset warning status*>
Lifetime Hours	<**K401,***hours10,message*>
Over-temperature	<**K402,***degrees,message*>

Command Title	Format
Under-temperature	<**K403,***degrees,message*>
Laser Overcurrent	<**K404,***message*>
Laser Undercurrent	<**K405,***message*>
Power-on/Resets Counts	<**K406,***powerups,resets*>
Time Since Last Reset	<**K407?**> *returns: hours,minutes (read only)*
Present Operating Temperature	<**K408?**> *returns: deg (read only)*
Narrow Margins/ Symbology ID	<**K450,***narrow margins status,symbology identifier*>
Background Color	<**K451,***background color*>
Code 39	<**K470,***status,check digit status,check digit output status,large intercharacter gap,fixed symbol length status,fixed symbol length,full ASCII*>
Codabar	<**K471,***status,start & stop match,start & stop output,large intercharacter gap,fixed symbol length status,fixed symbol length,check digit type,check digit output*>
Interleaved 2 of 5	<**K472,***status,check digit status,check digit output,length 1,length 2*>
UPC/EAN	<**K473,***UPCstatus,EAN status,supplementals status,separator status,separator character,supplemental type*>
Code 128	<**K474,***status,fixed symbol length status,fixed symbol length,,,,,,*>
UCC/EAN-128	<**K474,,,,***UCC/EAN-128 status,output format,application record separator status,application record separator character,application record brackets,application record padding*>
Code 93	<**K475,***status,fixed symbol length status,fixed symbol length*>
Pharmacode	<**K477,***fixed bar length status,fixed bar length,min. no. of bars,bar widths,forward/reverse*>
Scan Speed	<**K500,***scan speed*>
Bar Detection	<**K502,***(not used),minimum symbol transitions,maximum element*>
Gain/Tracking	<**K504,***gain adjustment,AGC sampling,AGC min,AGC max*>
AGC Settings	<**K505,***transition counter status,transition counter threshold*>>
Focus	<**K508,***focusposition,zero position*>
Beeper Output	<**K702,***beeper output*>
Output 1	<**K720,***output on,polarity,pulse width,output mode,number to output on*>
Output 2	<**K721,***output on,polarity,pulse width,output mode,number to output on*>
Output 3	<**K722,***output on,polarity,pulse width,output mode,number to output on*>

Appendix E — Serial Command Format

Serial commands are of two types: utility and configuration.

Rules that apply to both utility and configuration commands

- A less than **<** and greater than **>** characters enclose the commands.
- Commands and data are “case sensitive.” That is, characters must be entered as upper or lower case, as specified.

Serial Utility Commands

These are sent during operations and are not followed by a **<A>** or **<Z>.** See Table 11-1, “Summary of Utility Serial Commands,” on page 11-3.

Serial Configuration “K” Commands

These begin with a single **K** character followed by a character, data fields, and an initializing command, as follows:

<**K***parameterdata,data,...etc.*><*initializing command*>

An initializing command **<A>** or **<Z>** may follow the command. A **<Z>** initializes the scanner’s memory and saves for power-on; an **<A>** initializes the scanner’s memory but does not save for power-on.

For example, to enable **UPC** and save the change for power-on, send **<K*1*><Z>**.

To change **Baud Rate** and reset without saving changes for power-on, send **<Ka*3*><A>**.

Serial Configuration Command Conventions:

- All data fields (except the last) must be followed by a comma (without a space).
- The following characters cannot be used: , < > NUL.
- All fields preceding a modified field must be included.
- If there is no change in preceding fields, then commas alone can be entered in these fields. For example, if only the last field in the following command is changing, **<K*4,1,0,0*>** can be entered as **<K,,,*0*>**.
- All fields *following* a modified field can be omitted. For example, to change **Baud Rate**, send **<K*3*>**.

Concatenating Configuration Commands

Commands can be concatenated (added together) in a single string or data block.

Serial Command Status Request

To ensure that any command was received and accepted, you can send the **Show Scanner Status** command: **<?>**.

The status of a specific serial command can be requested by entering the command followed by a question mark, for example **<K101?>**.

Entering Special Characters in Serial Commands

To enter control characters within a serial command, hold down the control key while typing the desired character.

Entering Special Characters in Embedded Menus

Control Characters

Control characters entered on the command line are displayed in the menu as mnemonic characters, such as: <CR><LF><NUL><NUL>.

Press **SP** (the space bar) once, then enter the control character by holding down the control key and simultaneously pressing the desired character. For example to define a line feed, press **SP**, then **Control** and **J** simultaneously. It is displayed as ^J on the command line and as <LF> in the menu when the screen is refreshed.

To Define a Carriage Return as a Character

Press **SP**, then **CR**. It is displayed as ^M on the command line and as <CR> in the menu when the screen is refreshed.

To Define a Space as a Character

Press **SP** twice. It is displayed as a blank space in the menu when the screen is refreshed. While it appears that nothing has been assigned, the hex value 20 will be sent during data transmission.

To Select NUL as the Character

Press **SP**, then a **0** (zero). It is displayed as <NUL> in the menu when the screen is refreshed.

Appendix F — ASCII Table

Table A-8 ASCII Table with Control Characters

Dec	Hex	Mne	Ctrl	Dec	Hex	Ch	Dec	Hex	Ch	Dec	Hex	Ch
00	00	NUL	^@	32	20	SP	64	40	@	96	60	`
01	01	SOH	^A	33	21	!	65	41	A	97	61	a
02	02	STX	^B	34	22	“	66	42	B	98	62	b
03	03	ETX	^C	35	23	#	67	43	C	99	63	c
04	04	EOT	^D	36	24	$	68	44	D	100	64	d
05	05	ENQ	^E	37	25	%	69	45	E	101	65	e
06	06	ACK	^F	38	26	&	70	46	F	102	66	f
07	07	BEL	^G	39	27	'	71	47	G	103	67	g
08	08	BS	^H	40	28	(	72	48	H	104	68	h
09	09	HT	^I	41	29	)	73	49	I	105	69	i
10	0A	LF	^J	42	2A	*	74	4A	J	106	6A	j
11	0B	VT	^K	43	2B	+	75	4B	K	107	6B	k
12	0C	FF	^L	44	2C	,	76	4C	L	108	6C	l
13	0D	CR	^M	45	2D	-	77	4D	M	109	6D	m
14	0E	SO	^N	46	2E	.	78	4E	N	110	6E	n
15	0F	SI	^O	47	2F	/	79	4F	O	111	6F	o
16	10	DLE	^P	48	30	0	80	50	P	112	70	p
17	11	DC1	^Q	49	31	1	81	51	Q	113	71	q
18	12	DC2	^R	50	32	2	82	52	R	114	72	r
19	13	DC3	^S	51	33	3	83	53	S	115	73	s
20	14	DC4	^T	52	34	4	84	54	T	116	74	t
21	15	NAK	^U	53	35	5	85	55	U	117	75	u
22	16	SYN	^V	54	36	6	86	56	V	118	76	v
23	17	ETB	^W	55	37	7	87	57	W	119	77	w
24	18	CAN	^X	56	38	8	88	58	X	120	78	x
25	19	EM	^Y	57	39	9	89	59	Y	121	79	y
26	1A	SUB	^Z	58	3A	:	90	5A	Z	122	7A	z
27	1B	ESC	^[	59	3B	;	91	5B	[	123	7B	{
28	1C	FS	^\	60	3C	<	92	5C	\	124	7C	|
29	1D	GS	^]	61	3D	=	93	5D	]	125	7D	}
30	1E	RS	^^	62	3E	>	94	5E	^	126	7E	~
31	1F	US	^_	63	3F	?	95	5F	_	127	7F	D

Table A-9 Communication Protocol Commands

Protocol Command (Mnemonic displayed on Microscan menu)	Control Characters (Entered in menu or serial command)	Hex Code	Effect of Command
RES	^D	04	Reset
REQ	^E	05	Request
EOT	^D	04	Reset
STX	^B	02	Start of Text
ETX	^C	03	End of Text
ACK	^F	06	Acknowledge
NAK	^U	15	Negative Acknowledge
XON	^Q	11	Begin Transmission
XOFF	^S	13	Stop Transmission

Appendix G — Defaulting/Saving/Resetting

Understanding and controlling your reader's active, saved, and default settings is critical to the operation of your reader.

Table A-10 Software Reset/Save/Recall Commands

<A>	Reset (does not save for power-on)
<Ard>	Reset and recall factory defaults
<Arp>	Reset and recall power-on parameters
<Arc>	Reset and recall customer default parameters
<Z>	Save current settings for power-on
<Zc>	Save current settings as customer default parameters
<Zrd>	Recall factory default parameters and save for power-on
<Zrc>	Recall customer default parameters and save for power-on

Power-on Parameters

Power-on parameters (saved by the <**Z**> command) are saved to NOVRAM and recalled and loaded into current parameters when power is cycled or the <Arp> command is issued.

Customer Default Parameters

Customer default parameters (saved by **<Zc>** command) are the same set of parameters as power-on but are saved in a different, isolated section of NOVRAM. This can allow a user to essentially create a backup set of parameters that can be recalled in the event that the current parameters or power-on parameters have been changed and no longer desired. It is important to note that a hardware default does not affect these parameters. For example, a user that inadvertently changed communication settings in power-on parameters in such a way that they either don't know the settings or don't have the capability to communicate at those settings. By using the hardware default to default the power-on settings to the known factory default, the user can then recall their previously customer saved settings with the <**Arc**> or <**Zrc**> commands.

Factory Default Parameters

Factory defaults parameters are contained in the firmware that cannot be changed.

Software Factory Defaults

Factory default parameters can be recalled (loaded into current settings) with **<Ard>** command or recalled and saved for power-on with the **<Zrd>** command.

Hardware Factory Default

If a software default reset is not possible, it may be necessary to reset the reader by shorting (connecting) specific pins. This procedure has the same effect as the <**Zrd**> software command.

1. Apply power to the reader.
2. If using an IB-105, locate pins 7 and 11 on the host connector (see Table A-1 on page A-4).

   Caution: Be certain that the correct pins are located. Connecting the wrong pins could cause serious damage to the unit.
3. Momentarily connect these wires (or pins) and listen for a series of short beeps.
4. Within 3 seconds, connect them again. A longer beep should be heard. If not, repeat the process.

Default on Power-On

You can also use the EZ button to default the reader by holding down the EZ button while applying power to the reader, provided that this feature is enabled in "Default on Power-On" on page 5-31.

Default/Reset Definitions

Defaults are original or saved settings that can be recalled, either by software or hardware reset.

Defaulting occurs when default settings (customer or factory) are recalled. Defaulting might be necessary if you have make temporary changes, communications between the reader and another device are lost or interrupted, or you are using incompatible equipment (for example, a terminal that is set at 38.4K baud communicating with a reader that is set at 115.2K baud).

Resets ("**A**" commands) affect only the current settings (active memory) and are not saved for power on or recall.

Active Memory is where the reader's active settings are stored during use. These are not available on power-on unless saved by a "**Z**" command.

Hardware Default

Defaulting the scanner resets the configuration parameters to factory default values.

Defaulting is necessary if:

- You wish to quickly restore default settings to the configuration program after making some temporary changes.[1]
- Communications between the scanner and another device are interrupted because of incompatible settings (for example, a terminal is set to communicate at 9600 baud, but the scanner is configured at 38.4K baud).
- The scanner has been assigned a polling address and you wish to access the scanner's menu.

Access to the configuration menus of a scanner that is in a polled mode can be forced by sending a **<D>** command from an auxiliary terminal via the auxiliary RS-232 port.

Caution: Be certain that you short the correct pins. Shorting the wrong pins can cause serious damage to the unit.

Procedure:

1. Turn power to the scanner ON.
2. Locate and mark the default pins or wires connecting to default pins.
   If you have wired your own cable: locate pins 8 and 13 (figure A-2) on the back port of the MS-610 scanner.
   If using an ADP box: locate pins 11 and 7 (figure A-3) on the 25-pin connector.

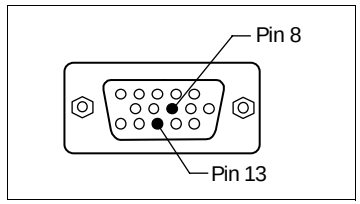


Figure A-2 15-pin Socket (on back of scanner)

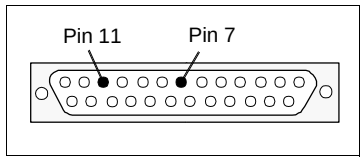


Figure A-3 25-pin Connector, RS-232 (J4) (on back of ADP box)

3. (Complete this step within three seconds.) Momentarily short the default pins. Listen for a series of quick beeps, then short the default pins again.
4. You should hear a longer beep. If not, repeat the process.

1. There are no menu options or host commands for resetting the configuration program.

Reader Status Requests

<?> Reader Status Byte

The reader responds to a status request **<?>** with a two character hex value, for example **<?/22>**. To determine the status:

1. Look up the binary conversion in table A-21.

   For example, the first **2** in binary would be **0 0 1 0** as read from binary digits 3 through 0; the second **2** the binary digits 7 through 4 which is also **0 0 1 0**.

2. Next, enter your binary values in table A-22 in the "Binary" column next to the appropriate bit.

Table A-12 Quadrus EZ Status

Bit	Binary	Reader Status
0	**0**	Command error detected
1	**1**	Command received
2	**0**	Communication error detected
3	**0**	Flash sector unprotect failure
4	**0**	Host/Aux port buffer overflow
5	**1**	Reader is in a read cycle
6	**0**	Software Watch dog reset
7	**0**	Hardware Watch dog reset

3. Under "Binary," interpret **1**s as true and the **0**s as not true. For example, bit 1 has a **1** in the "Binary" column, indicating "Command Received." Bit 5 is also a **1** indicating that the "Reader is in a read cycle."

Table A-11 Hex Value to Binary Conversion

Hex Value	Binary Bit Digits 7 6 5 4 / 3 2 1 0
0	0 0 0 0
1	0 0 0 1
2	0 0 1 0
3	0 0 1 1
4	0 1 0 0
5	0 1 0 1
6	0 1 1 0
7	0 1 1 1
8	1 0 0 0
9	1 0 0 1
A	1 0 1 0
B	1 0 1 1
C	1 1 0 0
D	1 1 0 1
E	1 1 1 0
F	1 1 1 1

<?1 > Extended Status

The reader responds to an extended status request **<?1>** with several fields.

These represent, in order: the status byte as discussed above, the boot part number, application part number, fpga part number, Flash checksum, and Flash parameter checksum.

<K?> Configuration Command Status

Returns the current status of all configuration commands.

Appendix H — Symbol Configuration

You can configure your scanner by presenting Code 128 symbols that the MS-3 scanner responds to as serial commands. **Note**: Your scanner does not need to be enabled for Code 128 in order to enter symbol configuration.

Entering Symbol Configuration

The symbol used to enter configuration is the 7-character code 128 symbol shown below. It is not required that the scanner be configured to read code 128 symbols to read this start symbol or the following configuration symbols.

To setup for symbol configuration:

1. Put the scanner in a read cycle mode.
2. Place a special Code 128 configuration start symbol in the scanners field of view.

   Use this symbol or one that you have created yourself.

   If the scanner is able to read the start symbol, it will begin to beep and the performance LEDs will be activated.
3. When the scanner starts to beep, remove the configuration symbol from the scanner's field of view.

   The beeping will end and the scanner will be in the configuration mode.

During the configuration mode the LEDs will emit a side to side "Knight Rider" pattern to let you know you are currently ready to configure.

You can create your own start symbol by encoding the following in Code 128:

FNC4 <_CFG>.

Using Configuration Symbols

Once in symbol configuration mode, serial command data encoded in Code 128 symbols is read by the scanner as serial input.

Configuration symbols must meet the following conditions:

1. The only valid configuration symbols are Code 128.
2. Symbol data may contain more than one command, but individual symbols must be presented one at a time. This is because only the first symbol in a read cycle record will be used as a possible configuration symbol.

3. A symbol that is presented to the scanner must be read 25 times consecutively to be used as a valid symbol.

   Once this is done the scanner will interpret the symbol data in the same fashion as it interprets serial data.

4. Any valid command may be entered via symbols including operational commands.

   Because the data is treated like serial input multiple symbols may be used to represent one command as long as the symbols are presented individually and in the correct order.

5. Read rate command may also be used to enter read rate from symbol configuration mode.
6. When in read rate, the scanner will read the symbologies that were enabled prior to entering the configuration mode. However it will read a "<J>" in code 128 regardless of current enable/disable state of code 128.

   Once the <J> is issued the scanner exit both read rate and symbol configuration. To exit read rate and remain in symbol configuration, you present the start symbol once again. Symbols read in read rate will not configure the scanner.

To start a read rate test, scan this symbol:

Exiting Label Configuration

There are multiple ways of exiting label configuration. The first way is to simply read or serially enter the "<J>" command. Other ways include any command that executes a software reset. These commands include the save family as well as the reset family e.g. <Z>, <Zc>, <Zrd>, <Zrc>, <A>, <Arc> and <Ard>. When exiting label configuration with the symbol "<J>," the scanner will beep in response.

To end the read rate test and the symbol configuration program, scan this symbol:

This will terminate symbol configuration mode. Changes made in configuration will remain in effect just as would changes made in the menus or by serial commands.

Appendix I — Object Detector

In a typical operation, a reader will wait for symbol data only during a triggered read cycle. A read cycle is initiated by a “trigger” and can be in the form of a serial command from the host (internal trigger) or a signal from an object detector (external trigger).

When an object detector (also called a sensor, package detector, etc.) is used, it is set up so that its beam will bounce off the approaching object and the resulting pulse will be sent to the reader to begin the read cycle. Typically, a detector is positioned so that it will detect the presence of an object before its symbol can be read.

An object detector is mounted in almost any position relative to the object as long as (1) the object passes within range of the detector and (2) direct or reflected light from the detector does not interfere with the reader’s reception.

As the item continues to move down the line, its symbol moves into the reader beam and is read by the reader.

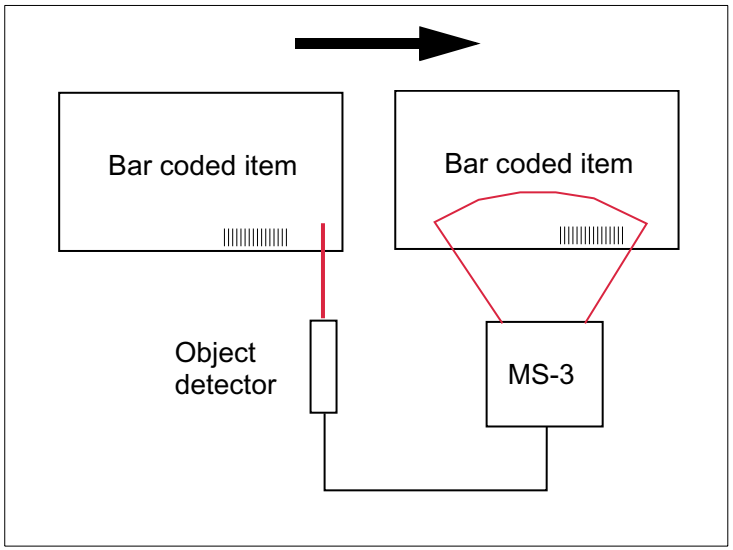


Figure A-1 Object Detector

Appendix J — Formulas for Number of Decodes

To ensure reliable scanning, apply a minimum of *five* decodes to each symbol. Use the formulas below to calculate the number of decodes that your symbol will receive.

If the number of decodes you derive from one of these calculations is less than the minimum for your application, plug in the minimum number of decodes (5) and solve for another parameter that might be changed, such as symbol speed or scans per second.

Note: While the formulas given here solve for the predicted number of decodes, you may also use the formulas to solve for other parameters that might be changed, such as symbol speed, symbol length, etc.

Single Line Ladder Calculation

For single scan line ladder scanning, use the following formula:

$$\left(\frac{SH}{SS} \times DR\right) - 3 = ND \text{ (number of decodes)}$$ [1]

SH *(Symbol Height) (ladder formula only) is a measurement of the height of individual bars.*

SS *(Symbol Speed) is the distance per second that a symbol moves through the scan.*

DR *(Decode Rate) is the number of decodes per second that a given symbol receives (as derived from a stationary scan test in "Test Decode Rate" on page A-43).*

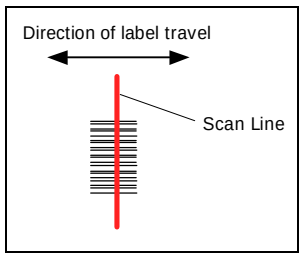


Figure A-2 Ladder

Single Scan Line Picket Fence Calculation

For single scan line picket fence scanning use the following formula:

$$\left(\frac{(SW - SL)}{SS} \times DR\right) - 3 = \text{number of complete decodes}$$

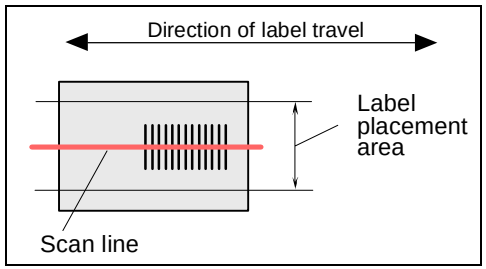


Figure A-3 Picket Fence

1. The -3 component in the formula is included to allow for AGC acquisition, an incomplete first scan, and an incomplete last scan. This applies only if the number inside the parentheses equals 4 or more. If the number equals 3, then only subtract 2 to derive 1 good scan.

Angled Picket Fence Calculation

The number of complete scans for angled picket fence is calculated the same as that for picket fence, with the exception that the scan width is shortened in proportion to scan tilt.

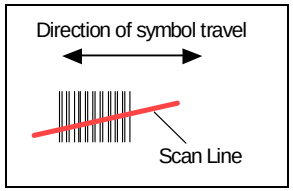


Figure A-4 Angled Picket Fence

Improving the Number of Decodes

After changing any of the parameters described in this section, recalculate the number of decodes.

Scan Rate

Scan rate is a function of motor speed and is adjustable. A slower scan rate may allow greater symbol range and/or higher decode rates, but at the cost of fewer scans per symbol.

Range

Adjusting the symbol's range, if possible, is one of the quickest and most effective ways to improve decode rates. However, in some applications you may need to select a less than optimum range, or one that is beyond the fringes of the ranges.

Scan Width

Increasing scan width will increase the number of scans in a picket fence oriented application. Scan width is linked with scan range and changing one will usually require a change in the other.

Symbol Speed

Applies to both picket fence and ladder oriented symbols. If your application allows it, slowing symbol speed (the time in seconds that a symbol is fully within the scan width of the scanner) is an effective way to increase the number of decodes.

Symbol Dimensions, Symbol Density, and Symbol Ratio

Not usually an option in most applications, but changes to symbol parameters can affect number of decodes calculations and possibly decode rates.

If your application allows it, shortening the length of a picket fence symbol means the symbol will be in the scan range longer and hence receive a greater number of scans. Increasing the height of a ladder symbol means it will receive more scans. Changing symbol density and/or symbol ratio is another way ranges, decode rates, etc. can be altered.

Appendix K — Operational Tips

Do:

- Check inputs (symbol speed, length, height, etc.) to ensure the desired number of decodes per symbol.
- For optimum decodes, mount scanner so that your symbols pass through the center of the depth-of-field (minimum/maximum range). You find the center by moving your symbol in and out during a read rate test.
- Avoid excessive tilt, pitch, and skew of the symbol.
- Check the symbol for readability by doing a decode rate test. If there is any question about the symbol's readability, contact your Microscan representative at ***helpdesk@microscan.com***.
- After changing any parameter that might affect decode rate, repeat decode rate test.
- Clean the scanner window with a clean, dry Q-tip or cotton cloth on a regular basis.

Do Not:

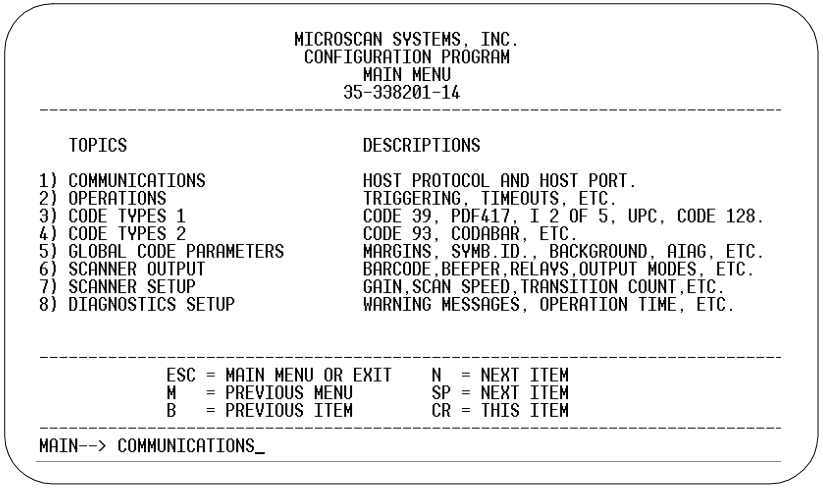
- Aim the scanner into direct light or sunlight.
- Aim the scanner into an external object detector or other light-emitting device.
- Obstruct the scanner window with mounting hardware or other objects.
- Connect chassis of scanner and host to different ground potentials.
- Operate the scanner in excessive temperature environments.

Appendix L — Embedded Menus

In addition to **ESP**, you can also use a communications menu such as Microsoft's HyperTerminal™ to establish communication with Microscan's embedded menus.[1]

1. With your host connected to Quadrus EZ, set your host communications settings as follows: **9600** baud, **7** Data Bits, **1** Stop Bits, and **None** Parity.
2. Set **Flow Control** to **None**.
3. Make the communications port selection. (Usually **COM 1** for Windows OS.)

Upon connection, send a **<D>** command to bring up the main menu.



Menu navigation commands are case sensitive. Use the space bar or **N** to advance to the next item, **CR** (return key) to select a highlighted item, **B** to return to the previous item, **M** to return to the previous menu, and **ESC** to return to the Main menu or to exit the program. When exiting the program, you will be prompted to save your active settings for power up (**Y** or **N**). Typing Y will be equivalent to saving with a <Z> command.

1. If you are using Microsoft's HyperTerminal program, you may find that the initial screen is not visible when you call up the program with the **<D>** command. If this occurs, exit the embedded menu with a **ESC**, **E**, and **N** sequence and repeat the **<D>** command.

Appendix M — Interface Standards

Interface Standards, established by the Electronic Industries Association (EIA), specify such things as the signaling voltage levels, maximum cable lengths, and number of drivers. With Microscan devices, selection of interface is made by pin assignment and, in the case of the host communications, by software switching between RS232 and RS422. Microscan devices use RS232, RS422, and RS485 multidrop.

RS232

RS232 defines an interface between two devices, such as the scanner and host. It differs from the other interfaces by dedicating individual pins to specific functions and by requiring both devices to share a common ground line. Since both device chassis are connected to a common ground, a ground loop potential and the possibility of noise interference exists; therefore, cable lengths are limited to a maximum of 50 feet (19.7m). Despite being the most limited, this interface is used frequently because of the large installed base of RS232 equipment.

RS422

RS422, unlike RS232, measures signals deferentially; that is, the receiver looks at the potentials between the two receive (or transmit) wires rather than the potential between signal and ground. As a result, cables, if shielded, can be up to 4000 feet (1219m) in length. Like RS232, RS422 communication is designed for only two devices on a single line and must have a common ground. It can be used wherever RS232 is used.

RS485

RS485, like RS422, can transmit up to 4000 feet (1219 m) using differential voltages, but unlike RS422, its transmitters are turned off until a request for data is received from the host. RS485 is used exclusively in multidrop protocol.

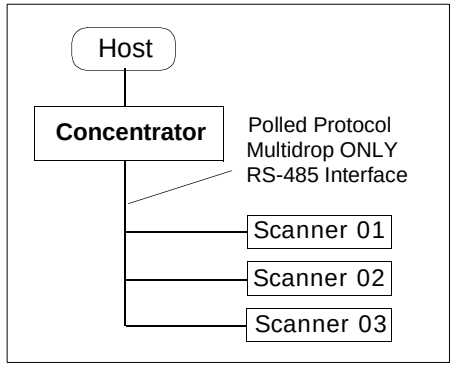
USB

The Universal Serial Bus can connect up to 127 devices to a host at a maximum of 6 megabits per second (Mbps) of bandwidth.

Appendix N — Multidrop Communications

This appendix describes the rules for setting up a concentrator or controller to communicate with a scanner in standard Multidrop protocol.

The diagram to the right shows a typical Multidrop network in which 1 to 50 scanners can communicate with a host via an intermediary device, a concentrator or a controller.



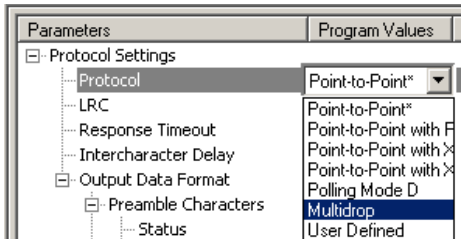
Configure Your Scanner for Multidrop

1. With the scanner connected to the host, do **Retrieve Scanner Settings** as in Step 7 —"Retrieve Scanner Settings" on page 1-11.
2. Select **Multidrop** in the **Protocol** configuration menu.

   You will see the following message:

   Important. *You must change your preamble and postamble characters so that they are not CR or NULL.*

   This allows data to move through the concentrator without interference.

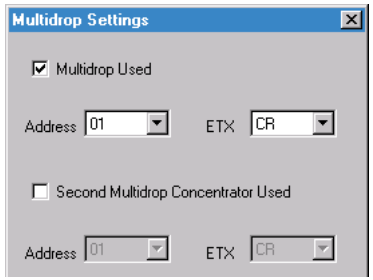


3. Click **OK**.
4. Next, go to **Preamble Characters** (still in the **Protocol** menu) and double-click on **Characters**.
5. This will open up an ASCII character table. Select any character other than **CR**. For example, select **LF**.
6. Repeat the above for **Postamble**.
7. Check the multidrop address. Enter a number from **01** to **50**.
8. Right-click in the window and select **Save to Scanner** and **Send and Save**.
9. Your scanner is now in multidrop. From here on, you will need to use the concentrator to relay commands and data between the scanner or scanners and the host.
10. Next, go to "Connect to Scanner via the Concentrator" on page A-52.

Connect to Scanner via the Concentrator

You will need a multidrop concentrator and the required power supplies and cabling to communicate with your scanner(s).

1. From the **Communications** drop down menu, select **Configure Multidrop** to bring up the **Multidrop Settings** dialog.



2. If necessary, change the default address to match the address of your multidropped scanner and click **OK**.

   If the host serial port is not connected in ESP, you will see the following popup message:

   ESP is not currently connected to the multidrop concentrator. Do you wish to establish a connection now?

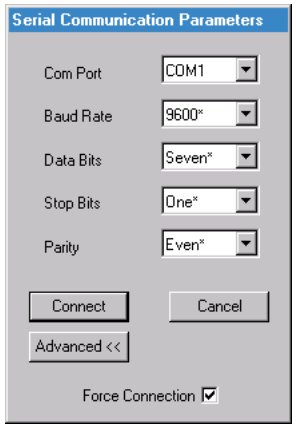
3. Click **Yes**.

   You will see a **Serial Communication Parameters** dialog as shown.

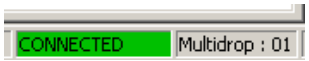
   Notice that the **Force Connection** option is checked. Do not change this.

4. Select the concentrator's host port communications settings.

   When you click **Connect**, you will be connecting to your concentrator, which can then relay commands to the scanner whose address was set in the **Multidrop Settings** dialog.



5. Click **Connect**.
6. You should see the **CONNECTED** message in green at the bottom of the window along with the scanner's **Multidrop** address.



7. Click **Retrieve Scanner Settings** to upload scanner's configuration. If upload fails, return to the **Serial Communication Parameters** dialog and make the corrections.
8. Follow the same procedure for connecting other scanners to your multidrop network.

Note: For more information, see your scanner user's manual or Microscan's ***MS-5000 Multidrop Concentrator User's Manual*, *83-005000*.**

A–Appendices

Polling Sequence

Data that is transmitted to the host (symbol data, noread messages, counters, etc.) via concentrators is solicited by poll requests from the host.

The polling sequence example is by poll address 1E (ASCII hex value for Scanner 02) and a REQ (request). The scanner responds by first transmitting its own address, 1E, followed by a STX (start of text) character, and then the data. Next it transmits an ETX (end of text) character and an LRC (longitudinal redundancy check) character.

If the concentrator (or controller) receives the data from the scanner and is able to validate it with an LRC calculation, it responds with an ACK (acknowledgment). If the scanner in turn receives the ACK, the scanner ends this exchange with a RES (reset).

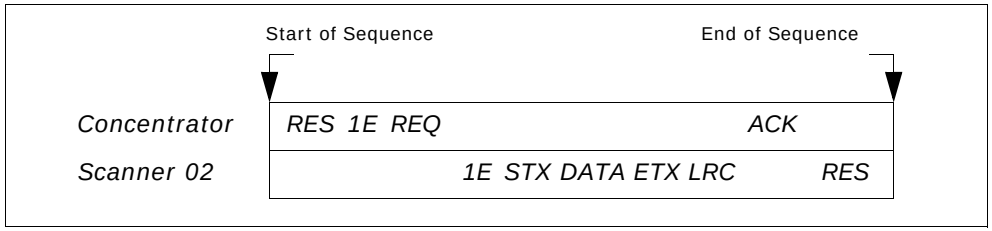


Figure A-5 Polling Sequence

Polling Reset

- If the scanner has no information, it responds to a poll request by transmitting a RES (reset).
- If the scanner receives a NAK instead of the ACK after transmitting its data string, it will re-attempt to send the data string up to three times. If the scanner still does not receive an ACK, it will send a RES (reset) and discard the data in its buffers.
- If the scanner transmits data to the concentrator and the concentrator responds with an ACK or NAK, but the scanner doesn't receive the concentrator's response, the scanner will timeout and send a REQ to the concentrator and request another response. If after three retries (the number of times it transmits a REQ to the concentrator) the scanner receives no response, it ends the transmission with a RES (reset).

Select Sequence

Unlike poll requests, select commands always originate from the host and consist of serial configuration or operation commands to devices that are configured in Multi-drop. The scanner complies with the command when it is polled during the cycle.

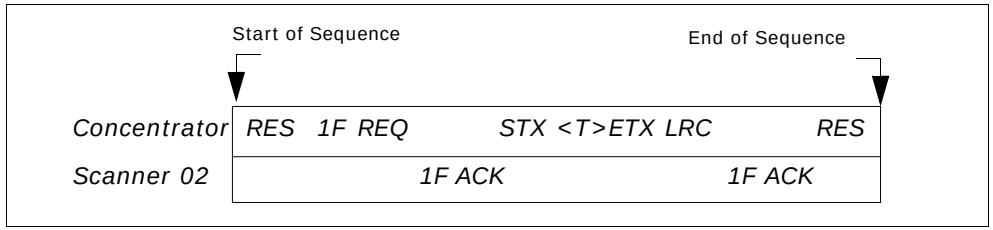


Figure A-6 Polling Sequence

A RES (reset) is the first command in the select sequence. The 1F hex is the select address associated with Scanner 02 address. It is followed by a REQ (request). The scanner responds with its own select address, 1F hex, and an ACK (acknowledge). The concentrator then transmits an STX (start of text), the data (in this case a <T>), an ETX (end of text), and an LRC character.

The scanner replies by transmitting its own address, followed by an ACK, acknowledging receipt of the command. Upon receipt of an ACK, the concentrator concludes the successful exchange with a RES.

In the example above, the scanner only acknowledges a trigger counter request from the concentrator. It does not respond to the trigger counter request until a subsequent poll. For example, if the scanner's trigger count was 12 at the time the trigger counter request was received, on a subsequent poll it would send 02T/00012. (The 02 at the beginning of the string is the scanner's address.)

Select Reset

If the scanner receives bad data from the concentrator, it transmits a SEL (its select address) and a NAK to the concentrator. The concentrator re-transmits the data up to three times. The concentrator will end the sequence with a RES (reset) if no ACK is received.

Table A-13 Multidrop Addresses

Multidrop Address	Poll Character		Select Character	
	ASCII	HEX	ASCII	HEX
01	^\	1C	^]	1D
02	^^	1E	^-	1F
03	SP	20	!	21
04	"	22	#	23
05	$	24	%	25
06	&	26	'	27
07	(	28	)	29
08	*	2A	+	2B
09	,	2C	-	2D
10	.	2E	/	2F
11	0	30	1	31
12	2	32	3	33
13	4	34	5	35
14	6	36	7	37
15	8	38	9	39
16	:	3A	;	3B
17	<	3C	=	3D
18	>	3E	?	3F
19	@	40	A	41
20	B	42	C	43
21	D	44	E	45
22	F	46	G	47
23	H	48	I	49
24	J	4A	K	4B
25	L	4C	M	4D

Multidrop Address	Poll Character		Select Character	
	ASCII	HEX	ASCII	HEX
26	N	4E	O	4F
27	P	50	Q	51
28	R	52	S	53
29	T	54	U	55
30	V	56	W	57
31	X	58	Y	59
32	Z	5A	[	5B
33	\	5C	]	5D
34	^	5E	_	5F
35	`	60	a	61
36	b	62	c	63
37	d	64	e	65
38	f	66	g	67
39	h	68	i	69
40	j	6A	k	6B
41	l	6C	m	6D
42	n	6E	o	6F
43	p	70	q	71
44	r	72	s	73
45	t	74	u	75
46	v	76	w	77
47	x	78	y	79
48	z	7A	{	7B
49	|	7C	}	7D
50	~	7E	D	7F

Appendix O — Glossary of Terms

Active On (I_{ON}). An optoisolated input that's logically "on" when current flows through the connection points.

Active Off (I_{OFF}). An optoisolated input that's logically "on" when *no* current flows through the connection points.

Analog Gain Adjustment (AGC). Adjustment to signal strength that seeks to maintain a constant level regardless of the range of the symbol.

Application Record. A variation of UCC/EAN-128 which adds an application identifier to symbol data, including user-definable separators, brackets, and padding.

Autocalibration. A routine that cycles through various optical settings and selects the combination that produce the best read rate.

Autodiscriminate. The ability to decode several different symbologies without changing configuration.

Auto Range. Outward focus of the scanner until an object is sensed by signal strength. The scanner then begins searching for a decodable symbol.

Auxiliary Port. Provides RS232 connections to an auxiliary terminal or device for remote viewing, for the transfer of data to and from the host, and under certain conditions as a configuration port.

Bar Code. A symbol.

Bar Code Density. Symbol size as measured by the narrow bar width.

Baud Rate. The number of discrete signal events per second. Bits per second.

Capture. The act of grabbing or recording a frame by a sensor. A frame or succession of frames that are captured.

Check Digit. A Modulus 43 or Modulus 10 digit that is added to the symbol message for additional data integrity.

Configuration. A setup or process of changing a scanner's settings to conform to a specific application. A physical arrangement of components.

Concentrator. Intermediary device that relays data from scanners to a host and commands from the host to the scanner or other devices.

Connector. Physical device (plug or socket) on a device or cable to provide in/out connectivity for various circuits and pins.

Counter. Memory space provided to keep track of scanner events.

Daisy Chain. Linkage of master and slave scanners to allow data to be relayed up to the host via auxiliary port connections.

Decode. A good read. The successful scanning and decoding of the information encoded in symbol.

Default. Restore ROM or Flash settings, initialize serial commands and reset all counters.

Delimited. A command or field that is bracketed by pre-defined characters.

Decode Rate. The number of reads decoded per second by a scanner or 2D reader expressed in percentages.

Depth of Field. The distance between the minimum and maximum range in which symbols have been read.

Discrete I/O. Inputs and outputs characterized by discrete signal transitions from one voltage level to another so that digital switching can occur.

Dynamic Setup. Testing and configuration done with symbols in motion.

Edge. Allows a read cycle to be initiated by a trigger signal from an object detector when it detects the appearance of an object (rising edge). The read cycle ends with a good read, a timeout, or a new trigger.

Embedded Memory. Onboard memory device such as EPROM or flash.

Embedded Menu. Configuration options embedded in the scanner's erasable memory.

End of Read Cycle. The time or condition at which the scanner stops expecting symbol information to decode.

ESP. Easy Setup Program. A portable proprietary Windows/NT based program developed by Microscan Systems, Inc.

EPROM. Erasable, programmable, read only memory.

Falling Edge. A change of state (to inactive) associated with a level trigger in which the scanner stops searching for symbols. (See **Rising Edge**.)

Fixed Symbol Length. Increases data integrity by ensuring that only one symbol length will be accepted.

Flash Memory. Memory that can be changed by downloading new code and recalled on power up.

Focal Length. The distance measured from the scanner to the center of the depth of field, or *focal* point.

Focus. The point at which the tip of the scan beam is at its narrowest.

Full Duplex. Auxiliary port data is sent directly to the host but not displayed on the auxiliary port screen.

Gain. Optimal signal strength.

Good Match. The event occurring when a scanned symbol matches the master symbol information that is stored in the memory of the device.

Good Read. A decode. The successful scanning and decoding of the information encoded in a symbol.

Half Duplex. Auxiliary port data is sent directly to the host and displayed on the auxiliary port screen.

Host. A computer, PLC, or other device that is used to execute commands and process data and discrete signals.

Host Port. The pins or connections on a scanner or other device that physically con-

nect with a host and—using the RS232, RS422, or RS485 standards—pass data and serial commands from one device to another.

Initialize. Implement serial configuration commands into the scanner's active memory.

Input. A channel or communications line. Decoded data or a discrete signal that is received by a device. See **Output.**

Intercharacter Delay. The time interval in milliseconds between individual characters transmitted from the scanner to the host.

Intercharacter Gap. The extra space between the last element of one character and the first element of the adjacent character of a specific symbol.

IrDA. Infrared Data Association which promotes interoperable, infrared data interconnection standards.

Label. The physical media on which a bar code symbol is presented.

Ladder Symbol Orientation. A bar code symbol in which the bars are parallel to the symbol's direction of travel.

Large Intercharacter Gap. Allows the scanner to read symbols with gaps between bar code characters that exceed three times (3x) the narrow element width.

Laser Framing. Setting scan width size by adjusting the on/off duration of the laser beam.

Laser On/Off. When enabled, the laser is ON only during the read cycle, provided the scanner is enabled for a Serial or External trigger.

LED. Light emitting diode.

Level. The condition in which a read cycle initiated by a trigger signal from an object detector remains active and ends when the object moves out of the detector's range.

Longitudinal Redundancy Check (LRC). An error-checking routine that verifies the accuracy of transmissions.

Master Symbol. A symbol or symbol data that is stored in a bar code scanner or 2D reader's memory and is compared with subsequently scanned symbols.

Master Scanner. First scanner in a daisy chain mode and linked directly to the host and in tandem to slave scanners.

Matchcode. The ability to compare symbol data being scanned against a master symbol that is stored in the memory of the scanner.

Mil. One thousandths of an inch or 0.0254 mm. In bar-coding, a measurement standard that identifies a symbol by the width of its narrowest element.

Mismatch. An event that occurs when the scanned symbol does not match the master symbol that is stored in the memory of the scanner.

Multisymbol. A scanner mode which allows a scanner to read more than one symbol in a single read cycle.

Multidrop. A communications protocol for networking two or more scanners or other devices with a concentrator (or controller) and characterized by the use of individual

device addresses and the RS485 standard.

Narrow-bar-width. The width of the narrowest bar of a specific bar code symbol, expressed in thousands of an inch (or mils) as defined by standard symbol types.

Narrow Margins. Allows the scanner to read symbols with quiet zones less than 8 times the width of the narrow bar element.

Non-delimited. A command that is not bracketed by pre-defined characters.

Noread. A non-read. A condition that occurs when the scanner is set up to decode symbols but no symbol is scanned during the read cycle.

Normally Closed. A discrete output state that is only active when open.

Normally Open. A discrete output state that is only active when closed.

NOVRAM. Non-volatile random access memory. Data that is saved for power-on is saved to NOVRAM.

Null. Also spelled Nul. A non-printed ASCII character that acts as a space-holder.

Number of Decodes. The number of times a symbol is scanned by the scanner during one pass through the laser beam.

Object Detector. A photo electric device used to sense the presence or absence of an object (also referred to as a package detector).

Output. A channel or communications line. Data or discrete signals that are transmitted or displayed by a device.

Output Format. The modification of data output according to a user-defined index of **Extraction** and **Insertion** commands.

Parity. An error detection routine in which one data bit in each character is set to 1 or 0 (zero) so that the total number of 1 bits in the data field is even or odd.

Picket Fence Symbol Orientation. A bar code symbol in which the bars are perpendicular to the symbol's direction of travel.

Pitch. Symbol (or scanner) rotation around the center of a line perpendicular to the symbol's bars.

Point-to-Point. A protocol consisting of a single communications event, typically used to connect a bar code scanner to a terminal or host computer.

Port. Logical circuit for data entry and exit. (One or more ports may be included within a single connector.)

Protocol. The rules for communication between devices, providing a means to control the orderly flow of information between linked devices.

Quiet Zones. Specified "clear" (non printed) areas immediately before and after the bar code symbol. The area is usually white (for black and white symbol) and at least 10 times the width of the narrowest bar, as measured in thousands of an inch. The zones can be other than white as long as their densities remain consistent and they have the required contrast relative to the bars.

RAM. (Random Access Memory) Memory that is lost after power is recycled to the unit.

Raster. Multiple, stacked scans produced by a separate oscillating mirror or by a spinning mirror with varying facet angles.

Read Cycle. A programmed period of time or condition during which the scanner will accept symbol input.

Reader. (1) Traditionally, a bar code device that can read but not decode symbols. (2) Currently, a device that reads and decodes 2D matrix codes.

Read Range. The distances in which a symbol can be reliably read, as measured from the front of the scanner. See “Depth of Field.”

Reed-Solomon Error Correction Code. A linear, error correcting block code, suited to the correction of character errors which could be, in bar or matrix codes, the obliteration or removal of part of the symbol.

Read Range. The distances in which a symbol can be reliably read, as measured from the front of the scanner. See “Depth of Field.”

Relay. An electrical switch that allows a low power to control a higher one.

Reset. Sets all counters to zero.

Rising Edge. A change of state (to active) that initiates (and in some cases ends) a read cycle with a new trigger, an edge trigger, or the leading edge of a level trigger. (See **Falling Edge**.)

ROM. (Read Only Memory) Memory that cannot be changed.

Scanner. A scanning device that is comprised of a scan head and a decoder integrated in one package.

Scan Rate (SR) The number of decodes per second that a given scanner is capable of casting.

Scan Width (SW) is the width across the scan beam at a given distance from the scanner in which a symbol can be read.

Send. Transmit data from one device to another.

Separator. A character that separates data fields.

Serial Commands. Online data strings such as <D> or <P> sent from a host or auxiliary terminal to a scanner or other device.

Serial Configuration (Host Configuration). Serial commands that change configuration; distinguished from operational command by the fact that they can modify non-volatile memory for power-on configuration.

Skew. Symbol (or scanner) rotation around the center of the skew axis.

Slave Scanner. A scanner linked to the master or preceding scanner in a daisy chain which relays symbol data to the host. See “Daisy Chain.”

Specular Reflection. The direct, mirror-like reflection of light back to the source causing saturation and bad reads.

Supplemental. A character or data string that is appended to the main bar code symbol.

Symbol. A bar code. A decodable graphic pattern containing information that is recognized by a bar code scanner or reader.

Symbol Data. The information that is transmitted from a decoded bar code symbol.

Symbol Height. Regardless of orientation, the measurement taken along the length of a symbol's individual bars.

Symbol Length. Regardless of orientation, the measurement taken across the symbol's bars from one end to the other, including the quiet zone.

Symbol Speed. The distance per second that a symbol moves in a dynamic application.

Symbol Transitions. The transition of bars and spaces on a symbol, used to detect the presence of a symbol on an object.

Symbology. A code type, such as Code 39 or Code 128, with special rules to define the widths and positions of bars and spaces to represent specific numeric or alphanumeric information.

Tilt. Symbol (or scanner) rotation around the centerline of the scan beam.

Timeout. The termination of a read cycle or other routine by time.

Timeout Duration. The actual time that elapses during a read cycle or other timed routine.

Tracking. Adjustment of the precision of analog-to-digital conversion.

Transmit. Send or convey signals or information from one device to another.

Transparent. Data that passed between the auxiliary port and the host with keyed data echoed to the auxiliary port

Trigger. A signal, transition, or character string that initiates a read cycle.

Watchdog Timer. A security device that detects system crashes and attempts to reset the scanner.

Watchdog Reset. A reset that is forced whenever the software locks up.

Wild Card. User-defined character entered into a master symbol to permit matches with variable characters.